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for the Behavioral and Social Sciences

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Computer Backgrounds of Soldiers in Army Units: FY00

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14. ABSTRACT *(Maximum 200 words)*:

The ability of soldiers to exploit systems using computers and to learn software quickly depends in part on their prior experience. Soldiers from four Army installations were given a survey that examined their experiences with computers, self- perceptions of their skill, and an objective test of their ability to identify Windows-based icons. The officers and senior non-commissioned officers (NCOs) had the most computer expertise as measured by both subjective and objective measures. For enlisted and junior NCOs the picture was more diverse; almost half the soldiers had limited skills. Owning a computer, frequency of using a computer, and using a computer at work related highly with computer expertise. When specialists (rank of E4) were examined separately, opportunity to use computers as part of their job was related to computer expertise. The results indicate a diverse population, including soldiers with limited computer skills as well as those with programming skills. Those individuals with limited skills would benefit from basic computer training prior to learning to operating one of the Army's digital systems.

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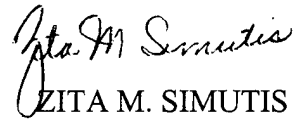
Personnel Performance and Training Technology

FOREWORD

The research described in this report was conducted by the Infantry Forces Research Unit of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) under its Training Modernization (TRAIN MOD) work package. Part of the research under TRAIN MOD involves addressing training issues associated with new Infantry systems that have computer software which soldiers and leaders must use to execute their missions. Both the Bradley Fighting Vehicle A3 and the Land Warrior system have such software subsystems. A key factor that training developers must address is the extent to which training on these "digital" systems will be hindered or complicated by weaknesses in soldiers' experience with computers and computer software. This report depicts the current computer backgrounds of soldiers within Army units, specifically Infantry battalions and their slice elements. It supplements a three-year survey effort, starting in FY99, which examined the computer backgrounds of infantrymen attending institutional courses. The research with Army units will be continued in FY01 to examine possible changes in computer usage and expertise.

Soldiers from four Army installations participated. At each installation, all members of an infantry company were surveyed plus the company's battalion staff and attached soldiers from field artillery, medical, and combat engineer units. Overall, the officers and senior noncommissioned officers had the greatest computer expertise as measured by the objective and subjective indicators of computer skill in the survey. For the remaining junior enlisted and noncommissioned officer soldiers, the picture was more diverse. Although a substantial percentage of soldiers from these groups had computer skills, many had limited skills. The importance of these findings is that current training on the Army's digital systems will require prior basic computer skill training for many soldiers.

The survey findings are valuable to the user community, as they can impact the design of training for digital systems and training resources. The findings were briefed to representatives from the U. S. Army Infantry School in August 2001. They were also presented to the Land Warrior Manpower and Personnel Integration (MANPRINT) Working Group in August 2001. The results are of value to MANPRINT agencies responsible for the manpower, personnel, and training domains; specifically, the Army's Personnel Command, the Project Manager – Soldier Systems, the Training and Doctrine Command (TRADOC) Systems Manager-Soldier, and the U.S. Army Infantry School.



ZITA M. SIMUTIS
Technical Director

COMPUTER BACKGROUNDS OF SOLDIERS IN ARMY UNITS: FY00

EXECUTIVE SUMMARY

Research Requirement:

The Army has introduced digital systems throughout the force. Although many systems are for battalion and higher-level leaders, other systems are for the individual soldier. The Land Warrior (LW) is a system designed for all infantrymen as well as soldiers and units that support the infantry such as medics, combat engineers, and field artillery. A computer is an integral part of the LW system. Therefore, the ability of a soldier to exploit system capabilities and learn system software quickly depends in part on that soldier's prior computer experience. A three-year effort began in FY99 to determine the computer backgrounds of soldiers in infantry units. The focus was on general computer skills that might transfer to using the LW and other digital systems. Soldiers attending infantry courses at Fort Benning, Georgia were surveyed. The impetus for the surveys was to examine the widely held assumption that senior soldiers possess fewer basic computer skills than younger soldiers. The initial results from the infantry courses did not support that assumption. The overall purpose of the present effort was to determine if the computer backgrounds of infantry soldiers in active units was similar to the soldiers attending infantry courses. An additional purpose was to determine the computer backgrounds of non-infantry soldiers who will use the LW and mechanized infantry soldiers.

Procedure:

Soldiers (n = 691) from four Army installations were given a survey that examined their experiences with computers, self-perceptions of their skill, and an objective index of skill as measured by the ability to identify commonly used icons and icons representative of those in the proposed Land Warrior software. The survey was given to soldiers from two mechanized and two non-mechanized infantry companies, their battalion staff, and soldiers from support elements, specifically the combat engineers, field artillery, and medics.

Findings:

The officers and senior non-commissioned officers (NCOs) had the most computer expertise and were the most homogeneous on both objective and subjective indicators of computer skill. For enlisted soldiers and junior NCOs the picture was more diverse; almost half the soldiers had limited skills. Owning a computer, frequency of using a computer, and using a computer at work related highly to computer expertise. When the specialists in the sample were examined separately, opportunity to use computers as part of their job was related to computer expertise. That is, those who used computers as part of their assigned duties used more computer features, had higher self-ratings, and had higher icon test scores.

Utilization of Findings:

The findings clearly showed a great diversity in computer background and experience within the Army populations surveyed. For some, computer experience was limited; they rated themselves as novices, a finding supported by the survey results from infantry courses. For others, computer experience came from different sources, and resulted in different levels of expertise and knowledge, with the most skilled possessing computer programming skills. This diversity, as long as it exists, will impact the training design and training management for new digital systems, as these systems, to varying degrees, assume soldiers have a core of computer skills and knowledge. Trainers will need to focus on basic computer skills before they can effectively and efficiently train the specific skills required by a tactical system. But for other soldiers, this prerequisite training will not be necessary. The extent to which training packages for any of the Army's digital systems should include special training on basic computer skills will depend both on the stability of these initial findings and the tactical software embedded in these systems.

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Background

Digital systems are being tested and fielded by the Army. Many systems are currently in the inventory across all branches of the Army. The near future will likely see an even greater number of digital systems in use. Currently, information technologies provide digital information primarily to commanders of units at battalion and above in tactical operations centers (GAO Report, 2000). Because of increased durability and portability, a greater number of digital systems will be in use at lower echelons. The Land Warrior (LW) system (Goodman, 1999) is one digital system that will be used by infantry soldiers down to the soldier level. A wearable computer using a Windows operating system with menu- and icon-based software is the heart of the LW system. Soldiers will use the computer to perform tasks and functions previously performed manually by soldiers. The current research effort was initiated to determine the computer backgrounds and experiences of soldiers likely to use the LW and similar systems.

A widely held assumption among Army trainers is that young soldiers are computer literate and that older soldiers are computer illiterate. The purpose of the present research was to test this assumption by determining the computer backgrounds of soldiers. If basic computer skills transfer to a variety of digital systems, then based on this assumption the younger soldiers should learn to operate new systems more quickly. The results could then be used to determine whether training on basic computer skills would be beneficial prior to actual training on a new digital system.

The present research compliments the first and second year (Dyer & Martin, 1999; Fober, Bredthauer, & Dyer, 2000) of a three-year effort. The purpose of the three-year research is to determine the computer backgrounds of infantry soldiers and whether soldiers' backgrounds and experiences with computers are changing over time. The research project covers infantry soldiers in professional courses as well as a broader population of soldiers in Army units. This report is on the latter population.

Results from the first two years of surveys (Dyer & Martin, 1999; Fober, et al., 2000) provided information about the computer backgrounds of infantry soldiers attending professional development courses at Fort Benning, Georgia. The intent of sampling the courses was to replicate the ranks within a typical infantry platoon. The institutional courses surveyed included One Station Unit Training (OSUT), Basic Noncommissioned Officer Course (BNCOC), Advanced Noncommissioned Officer Course (ANCOC), and Infantry Officer Basic Course (IOBC). Because a rifle platoon is composed of soldiers with considerable differences in Army experience, educational backgrounds, and ages, the computer skills of these soldiers differed greatly as well (Dyer & Martin, 1999; Fober, et al., 2000).

The research reported here expands the population to active infantry units. Although samples from the institutional courses were intended to replicate a platoon, all ranks of a platoon were not represented (e.g., specialists, rank of E4). In addition to actual infantry platoons, the present research was expanded to include staff members and slice elements scheduled to receive

the LW system as well as mechanized infantry units. The findings provide a clearer picture of current computer experiences and backgrounds of soldiers in units.

The survey information on soldiers' computer backgrounds may offer the detail required to determine which segments of the populations surveyed might benefit from computer training as well as the computer tasks most likely to require training. Computer prerequisite skills coupled with necessary military knowledge and experience are required for successful employment of digital systems. Individuals with extensive background and experience require different training than individuals with minimal background and experience (Van Vliet, Kletke, & Charkraborty, 1994).

The report describes the results of a survey administered to infantry units in FY00. It also compares these results to the data collected from institutional courses at the U. S. Army Infantry Center and School in FY99 and FY00 (Dyer & Martin, 1999; Fober, et al., 2000).

Method

Participants

The intent of the sample was to include the soldiers who will use the LW system. Consequently, the surveys went to the attached elements that will also be fielded with the LW system and interact with the infantry. The surveys were sent to two non-mechanized infantry units and two mechanized infantry units. There were two reasons for including mechanized infantry units. Eventually these units will be fielded with the LW system, although the initial fielding will be to dismounted infantry. In addition, some mechanized units will soon receive the Bradley Fighting Vehicle (BFV) A3 that employs a computer subsystem. Information on the computer skills of this infantry population was considered relevant to training on the BFVA3.

The surveys were sent to four Army installations. Unit personnel distributed the surveys. The guidance was that the surveys were to be completed by all soldiers assigned to an infantry company, the battalion staff associated with that company, all soldiers attached to the battalion from field artillery and medics plus one combat engineer platoon. A total of 691 surveys were returned for analysis. The actual return of the surveys included one brigade staff and one armor staff not originally requested. In addition, there were no surveys for medics and engineers from one unit.

The surveys were grouped two ways. One grouping was based on duty assignment (called battalion element): battalion and brigade staff, field artillery, engineers, medics, and infantry rifle company members. The other grouping was by rank. The distribution of ranks within each soldier group is shown in Table 1. The senior noncommissioned officers (NCOs -- E6-E9) and the officers (O1-O5) were grouped because of the low number of surveys in those groups. Although these two groupings span a wide range of age and experience, they were represented primarily by the lower ranks, E6 and E7 (90 of 99) for the senior NCOs, and O1 and O2 (39 of 48) for the officers (see Table A-1 for individual ranks).

Table 1
Number of Soldiers by Rank in Each Element

Rank	Battalion Element					
	Battalion & Brigade Staff	Field Artillery	Engineers	Medics	Infantry	All Elements
E1-E2	10	12	13	7	78	120
E3	13	10	5	11	67	106
E4	50	13	23	32	102	220
E5	14	6	13	11	54	98
E6-E9	45	11	4	8	31	99
O1-O5	31	3	3	1	10	48
Total	163	55	61	70	342	691

Note. E1-E2 is private. E3 is private first class. E4 is specialist or corporal. E5 is sergeant. E6-E9 is staff sergeant, sergeant first class, first sergeant/master sergeant, and sergeant major/ command sergeant major. O1-O5 includes 2d and 1st lieutenants, captain, major, and lieutenant colonel.

Soldier rank was not distributed equally across battalion elements. Interestingly, specialists (E4s) constituted the most common rank within each battalion element (from 24% to 46%). The next most common rank varied with element. For battalion staff and field artillery it was E6-E9; for medics it was E3 and E5, for engineers it was E1-E2 and E5, for infantry it was E1-E2. The percentage for each of these ranks was typically 20%. Of note, is that officers constituted the third largest group in the battalion staff (19%), with 5% or fewer officers in the other battalion elements (see Figure A-1).

There is an obvious relationship between soldiers' age and his rank within the NCO and officer corps, respectively. For enlisted soldiers and NCOs, age increased with increase in rank . The mean ages were: 20.29 (SD = 2.22) for E1-E2; 21.01 (SD = 2.07) for E3; 23.59 (SD = 3.29) for E4; 26.85 (SD = 3.27) for E5, and 33.81 (SD = 5.12) for E6-E9. The officers' mean age was 28.54 (SD = 4.65). Tables A-2 and A-3 present descriptive statistics on age by rank and battalion element. Tables A-4 and A-5 provide descriptive statistics on months served in the Army.

Survey Instrument

The survey instrument is presented in Appendix C. It was developed during the FY99 research (Dyer & Martin, 1999). The original survey was revised to obtain the necessary demographic information from each installation (e.g., infantry, field artillery). In addition to demographic information, the survey focused on seven areas:

- Where soldiers have used computers in their formal education.
- Where they currently use computers.
- Whether they own a computer.
- How often they use specific computer features: a mouse, computer games, icon-based software, pull-down menus, graphics/drawing features, e-mail, and the Internet.
- Self-ratings of typing skill.

- Self-ratings of computer skill and what computer software/languages they use.
- An icon test, with 18 icons common in current software programs, was presented and soldiers had to name the function of each icon. The icons represented: spell check, cursor, zoom, open file, save, print, cut, copy, paste, undo, new file, arrow, recycle, help, center, fill, close, and group.

Survey items on computer features and Windows icons were included because the LW computer software is Windows-based. Therefore, familiarity with using features like a mouse or pull-down menus should enhance transfer of those skills to learning LW computer functions. Other features like e-mail and Internet are relevant because soldiers using the LW will be connected via a wireless local area network (LAN). It was also thought that use of Windows-based characteristics would provide an index of computer experience for all soldiers, given the dominance of Windows software in the commercial world.

A coding scheme was developed for scoring the icon responses. It is presented in Appendix D. Some latitude was given to scoring answers, as the icons have slightly different meanings within various software programs. The inter-rater reliability was checked formally on two separate occasions. Dyer and Martin (1999) reported an inter-rater reliability of 98% for an earlier coding scheme. Fober, et al. (2000) reported an inter-rater reliability of 95% using a revised coding scheme. The coding scheme in Appendix D is identical to that used by Fober, et al. (2000). The inter-rater reliability was not determined in this study because of the high ratings in the previous two studies.

Results for Entire Sample

Results are presented first for the entire sample, by rank and by battalion element. These two dimensions were not examined in the context of a single analysis, as the resulting sample sizes were diverse and some were rather small (see Table 1, only one medic was an officer versus 102 infantrymen who were specialists). As mentioned, the specialist (E4) sample was large and distributed across the battalion elements. Consequently, a separate analysis was made of these soldiers, as this analysis controlled for age and rank. These results follow those for the entire sample.

The rank breakout corresponded to the data collected from the infantry professional development courses. The most junior enlisted members were comparable to the OSUT (basic training) soldiers, the junior NCOs to BNCOC, the senior NCOs to ANCOC, and the youngest officers to IOBC. The unit surveys covered higher-ranking officers as well as enlisted soldiers at the ranks of E3 and E4 not included in the prior institutional analyses (Dyer & Martin, 1999; Fober, et al., 2000). Additionally, as stated above the present analyses expanded the prior research by including branches other than the infantry, plus the battalion staff.

Inferential statistics were applied to the data, despite the unequal sample sizes for some of the groups compared. These results were used as a guide to help determine what differences were important to discuss. The authors acknowledge the confounding between the rank and battalion element variables (e.g., most officers were in the battalion staff). Complete descriptive statistics on the survey measures by rank and battalion element are in Tables A-1 through A-38.

The results on each key variable are discussed, followed by two graphs, one highlighting the results by rank and the other the results by battalion element. For a given dimension or variable, we placed the rank graph and the battalion graph on the same page so the reader could visually compare the results. Any two graphs required an entire page. Thus it was not possible to have the relevant text and the graph on the same page. However, the graphs follow their reference in the text and in some cases, the text and graphs appear on facing pages to reinforce understanding the main points. The same type of graph (typically a bar graph) was used wherever possible. In some cases, the graph format changed (e.g., to a line graph), if that format more clearly illustrated the findings.

Computer Use

Use in school. The survey was designed to obtain general information about the soldiers' current and prior experience with computers. The first background item related to the extent to which soldiers used computers in their formal education. Figures 1 and 2 show where soldiers used computers in school, compiled by soldier rank and battalion element, respectively. Figures 3 and 4 show the number of educational settings where soldiers used computers. For example, if a soldier had only used a computer in high school, the tally was one. If a computer was used in junior high and high school, the tally was two.

Examination of Figure 1 reveals that the percentage of soldiers using computers during their formal education varied across soldier rank and was primarily a function of age. A closer look at computer use in high school across the enlisted ranks demonstrates this point. Nearly 83% of the youngest group (E1-E2, $M = 20.29$ years old) used computers in high school closely followed by E3s ($M = 21.01$ years old) with 80%. As the mean age of the soldier ranks went up, the computer use in high school went down. For E4s ($M = 23.59$ years old) and E5s ($M = 26.85$ years old) computer use in high school was 75% and 61% respectively. The soldier rank having the least computer use during high school was the senior NCOs (E6-E9, $M = 33.81$ years old). Only 23% reported using computers in high school. The total number of educational settings in which soldiers used computers was also examined as a function of rank, $F(5, 685) = 20.35$, $p < .0000$. Post hoc comparisons[1] showed that E6-E9 soldiers used computers in the fewest number of educational settings compared to each other group. In fact, 44% of these soldiers, the oldest group, had never used computers in school (see Figure 3).

Examination of educational settings by battalion element (Figure 2) showed fewer differences across the groups. Again, using high school as a comparison because many enlisted soldiers have not attended college whereas all officers have attended college, about 70% of the battalion elements had used a computer in high school, with fewer (55%) of the staff using a computer in high school. Age was the obvious factor in computer use in formal education, with staff members being the oldest element. The total number of educational settings was also examined for the battalion elements, $F(4, 686) = 3.78$, $p < .005$, with staff members using computers in the fewest number of educational settings. Of the staff members, 22% had never used computers in school (see Figure 4).

[1] For all post hoc comparisons with the analyses of variance, the Tukey honest significant difference test (HSD) for unequal n was used.

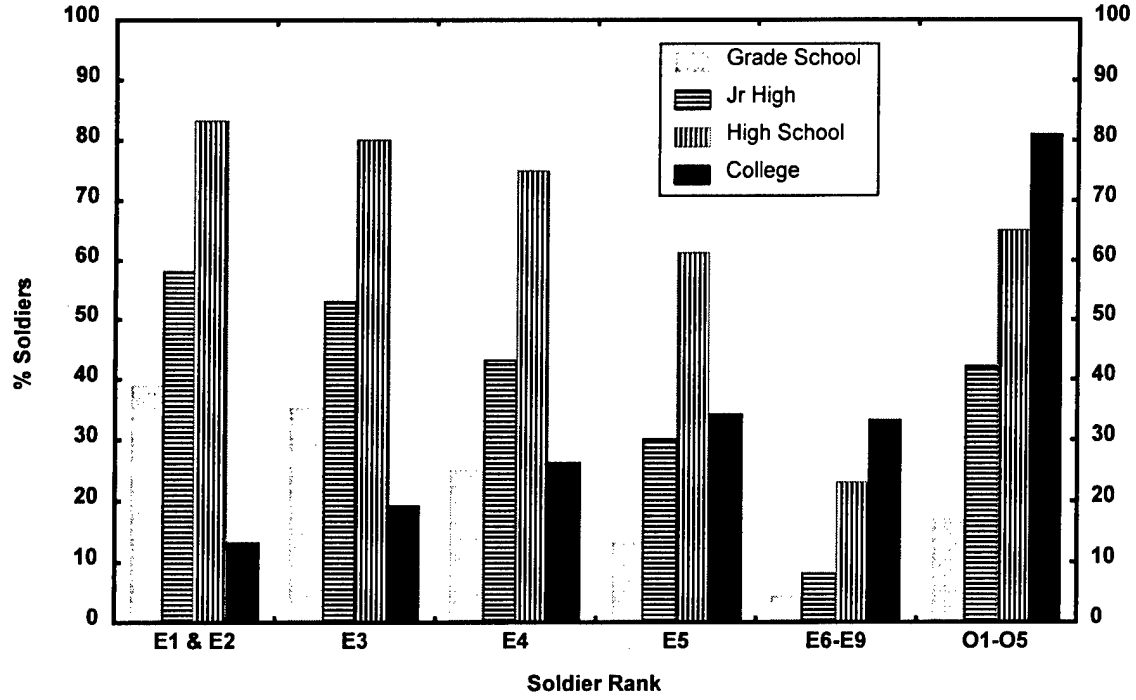

Figure 1. Percentage of soldiers using a computer in school, displayed by soldier rank.

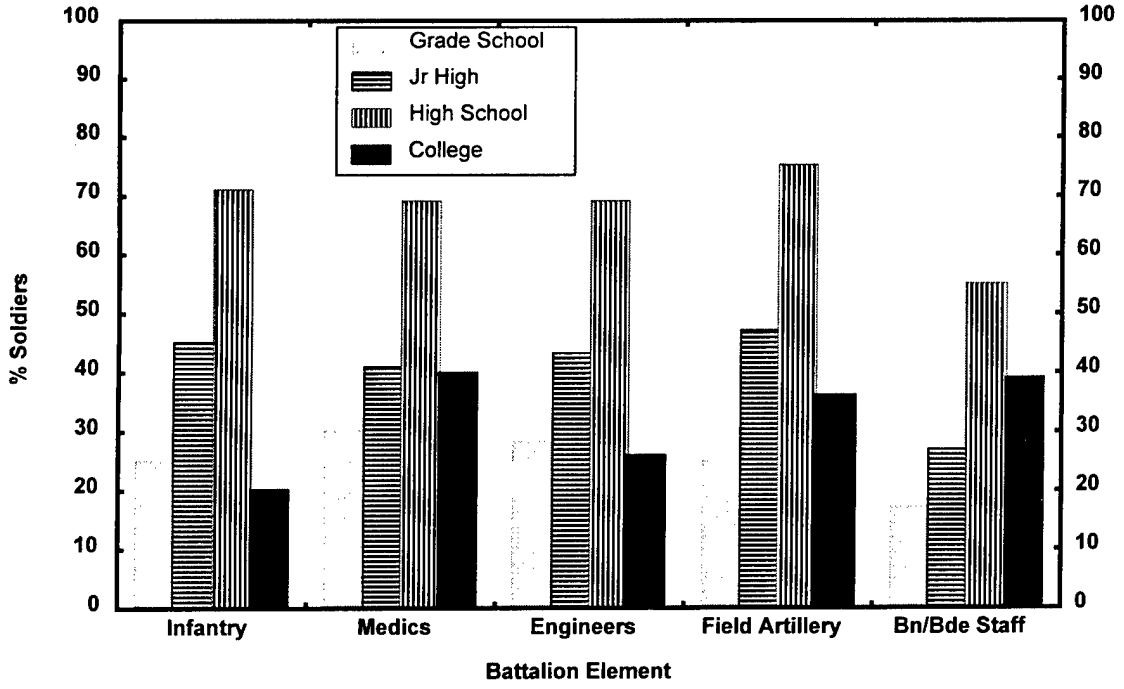

Figure 2. Percentage of soldiers using a computer in school, displayed by battalion element.

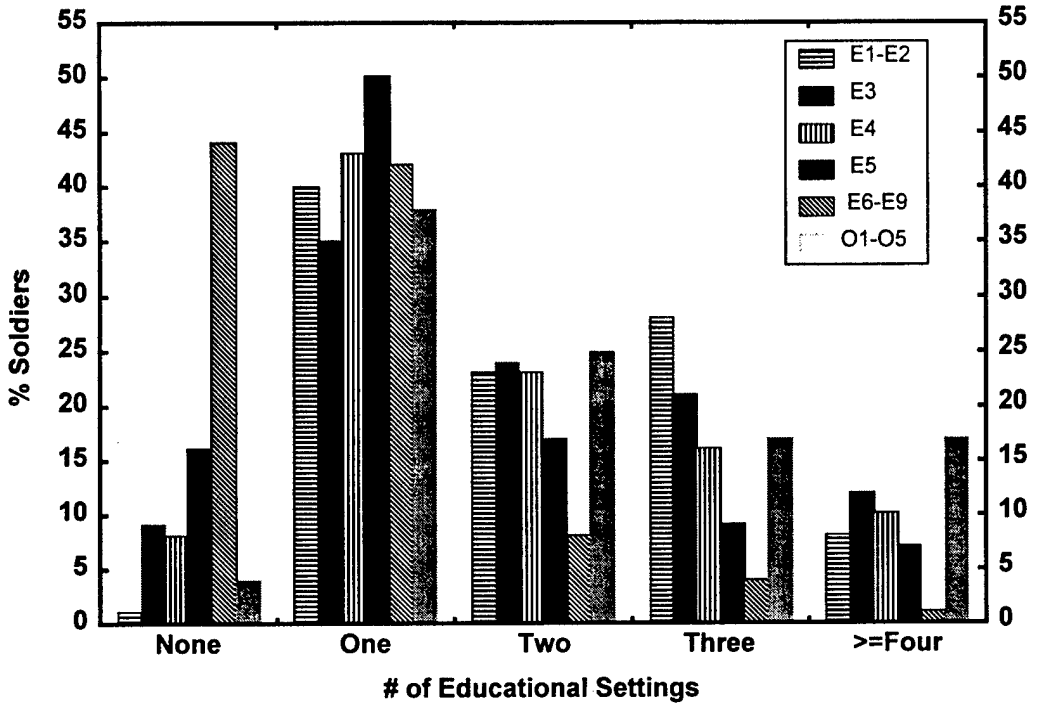

Figure 3. Number of educational settings where a computer was used by rank.

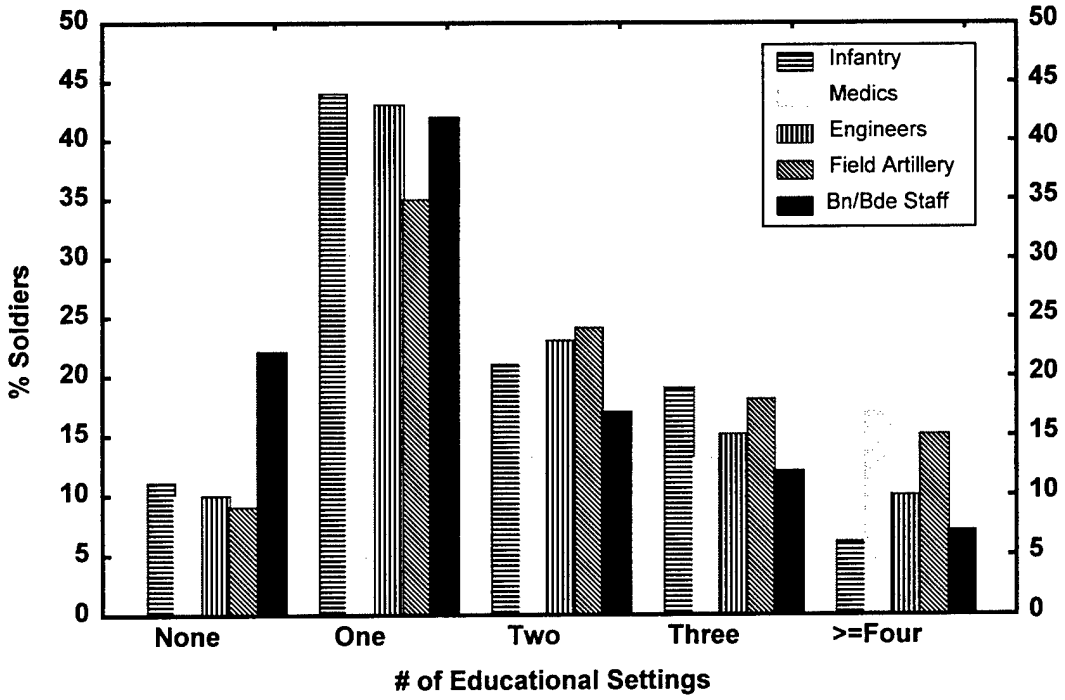

Figure 4. Number of educational settings where a computer was used by battalion element.

Computer ownership and computer use. Another question concerning computer use was whether soldiers owned a computer. Computer ownership can depend on many factors and the ability to afford a computer might be a primary one. Examination of computer ownership across soldier rank revealed substantial differences in ownership rates (Figure 5). The lowest percentage (23%) owning computers occurred within the junior enlisted ranks (E1s and E2s). Eighty-three percent of the senior NCOs owned computers and 96% of the officers owned computers. Significant differences occurred, $F(5, 685) = 38.09, p < .0000$. Post hoc comparisons showed differences between all groups except for equivalent percentages for the staff and E6-E9 group, and for the E1-E2 and E3 groups.

When asked if they were currently using a computer, the response was high overall. As with computer ownership, the lowest rank group, the E1s and E2s, had the lowest usage percentage (72%). Everyone in the staffs said they used a computer (see Figure 5). Significant differences occurred among the ranks, $F(4, 638) = 8.26, p < .0000$. This statistical analysis was conducted without the officers, as that percentage was 100%. More soldiers in the E5/E6-E9 groups used computers than soldiers in the E3/E1-E2 groups.

For every rank, the percentage of soldiers using a computer was higher than the percentage owning a computer. This difference was substantial for the lowest ranking soldiers. Few soldiers at or below the rank of E3 (less than 30%) owned a computer. Yet at least 72% of these soldiers indicated they used a computer, typically at home or in the barracks.

The most common place to use a computer was at home (Figure 5). However for senior NCOs and officers, the workplace was just as common. From Figure 5, it is also clear that the lowest ranking soldiers (E3 and below) did not typically use a computer in their units, but the percentage greatly increased for those at the rank of E4 and above. Soldiers were also asked about computer use in training facilities. But because these percentages were low and similar across ranks, they were not included in Figure 5, but are in Tables A-10 and A-11.

Computer ownership across battalion elements did not vary as much as ownership across rank. Figure 6 presents the same data as in Figure 5, but by battalion element. At least 60% of the staff members[2], field artillery, and engineers reported owning computers. Infantry and medics ownership was lower, 44% and 43% respectively. The only significant group difference was between the staff and both the infantry and medics, $F(4, 686) = 7.05, p < .0000$.

Again overall computer usage was high. Infantry was the lowest, with 77% reporting using a computer, and the infantry percentage was significantly lower than the staff members (96%), $F(4, 686) = 8.46, p < .0000$. Where soldiers used a computer varied greatly by battalion element (Figure 6). Except for the medics and battalion staff, home usage was much more common than use at work or in the unit. In fact, 86% of the staff members reported using a computer at work versus 72% using a computer at home. This high rate is consistent with the responsibilities of their staff duty positions. Work/unit percentages were low for the other groups (40% for field artillery, 25% for engineers and 22% for infantry).

[2] Of the battalion staff personnel 42% were infantry, 23% armor, and 35% from other branches (primarily adjutant general, chemical, military intelligence, quartermaster, and signal).

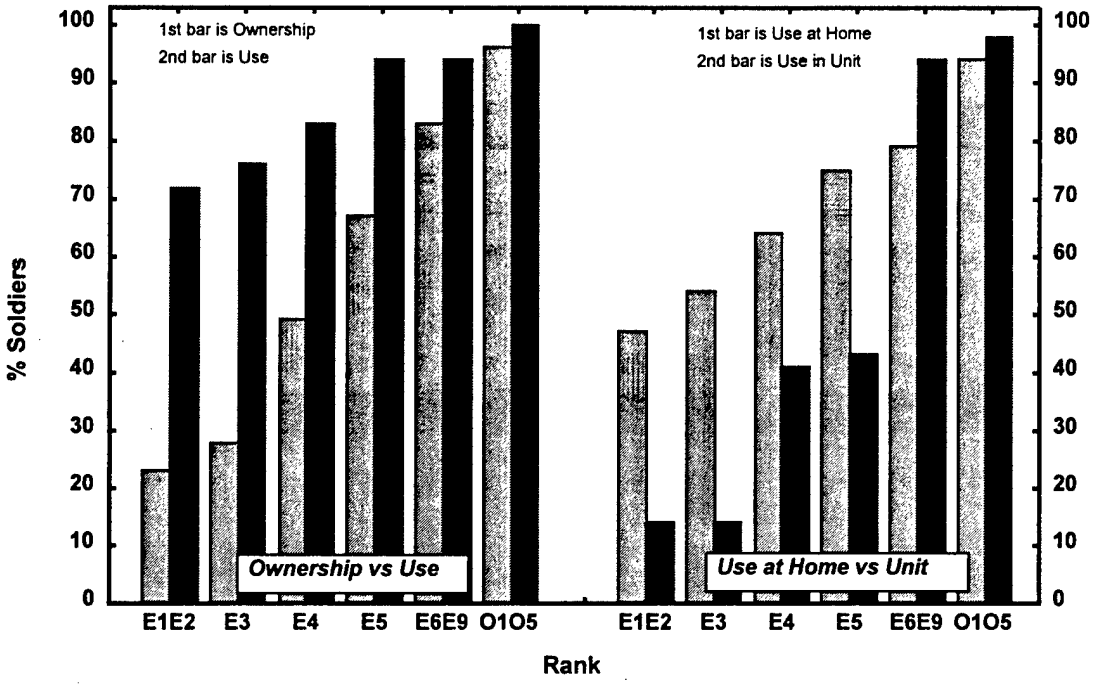

Figure 5. Computer ownership and use, and home and unit use by rank.

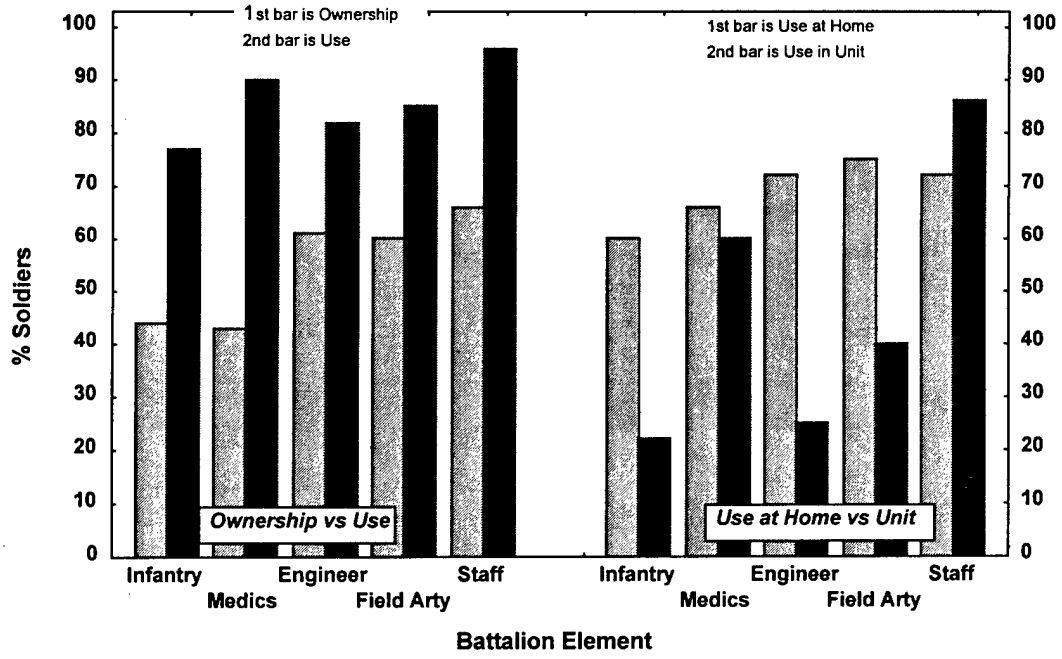

Figure 6. Computer ownership and use, and home and unit use by battalion element.

Subjective Indices of Computer Skill and Expertise

The survey provided several subjective indices of computer skill: the frequency with which different software features were used, self-ratings of expertise, use of specific software packages, and self-ratings of typing skill. These indices correlated positively with objective measures of skill (Dyer & Martin, 1999; Fober, et al., 2000). Although typing skill is not a direct index of computer skill, soldiers who use a computer extensively, should become facile with a keyboard.

Typing skill. No more than 17% of the soldiers from any rank indicated they had limited typing skills, i.e., could only hunt and peck slowly at a keyboard (see Table A-12). The ratings of typing skill by soldier rank did not differ, χ^2 (15) = 22.53, $p < .10$. However, the officers perceived their typing skill as better than the other groups. Only 2% of the officers indicated they had limited typing skill as compared to 13% to 17% for the other soldier ranks. Conversely, 42% of the officers rated themselves as being able to type quickly compared to 17% to 22% for the other soldier ranks.

There was some variation across the battalion elements (see Table A-13) at the lowest skill level (hunt and peck slowly) and the highest skill level (type quickly). Field artillery perceived their typing skill as higher than the other elements with only 2% reporting their skill level was hunt and peck slowly and 36% reporting they could type quickly. This contrasted with the other groups ranging from 10% to 21% for hunt and peck slowly and 13% to 26% reporting they could type quickly, χ^2 (15) = 34.27, $p < .0003$.

Computer features. Soldiers were asked how frequently they used seven common computer features: mouse, games, software with icons, software with menus, graphics, e-mail, and the Internet. The frequency scale had five-points ranging from daily, weekly, monthly, less than monthly, to never (see survey in Appendix C). From the highest to the lowest usage, the features ordered as follows, mouse, Internet, e-mail, menus, icons, games, and graphics. Compared to the earlier surveys ((Dyer & Martin, 1999; Fober, et al., 2000), it appears that Internet and e-mail use are increasing relative to other computer features.

A 6 x 7 (soldier rank by computer features with repeated measures on the last factor) analysis of variance (ANOVA) was conducted on the means frequency of use. The means and standard deviations for the frequency of using computer features, displayed by soldier rank, are in Table A-16. There was a main effect for soldier rank, $F(5, 685) = 19.55$, $p < .01$, a main effect for features, $F(6, 680) = 91.49$, $p < .01$, and an interaction effect, $F(30, 3420) = 6.25$, $p < .01$. Figure 7 reflects the trends from this analysis. The officers and senior NCOs had the highest usage for all features except games. This finding is similar to the earlier findings from soldiers attending infantry courses (Dyer & Martin, 1999; Fober, et al., 2000).

Examination of usage across battalion elements revealed similar patterns (Figure 8, see Table A-17 for means and standard deviations). Except for games, staff members rated themselves as using all of the features more often than the other battalion elements. Infantry had the lowest frequency of use for all features. There were significant main effects [element - $F(5,$

685) = 12.47, $p < .001$; features – $F(6, 680) = 48.75$, $p < .001$], and a significant interaction, $F(30, 3420) = 2.49$, $p < .001$.

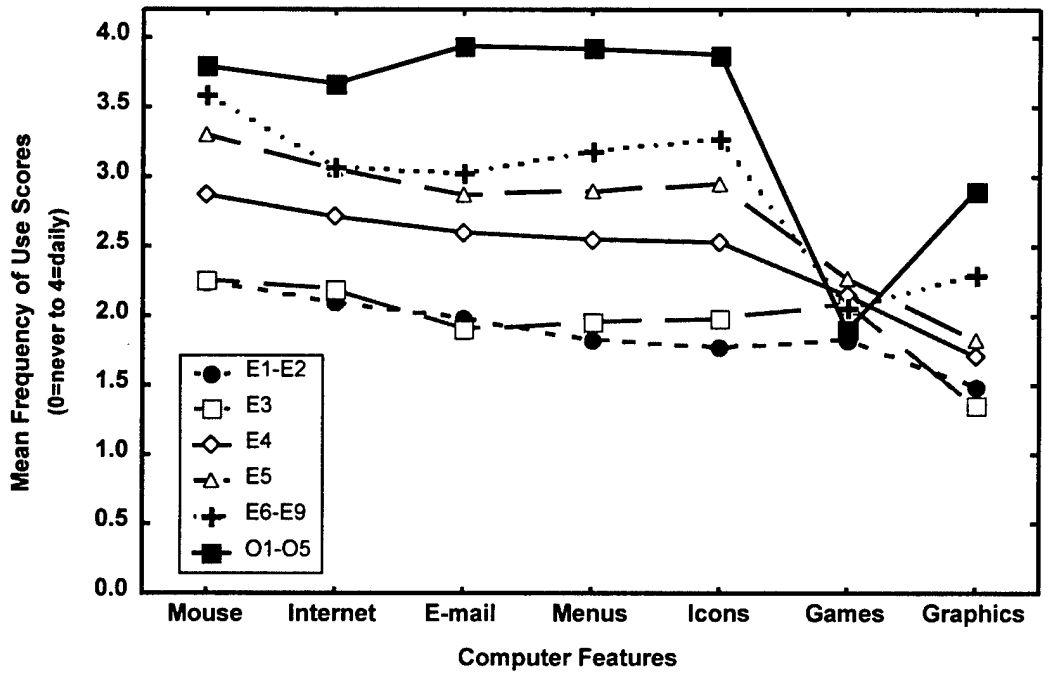

Figure 7. Interaction between soldier rank and use of computer features.

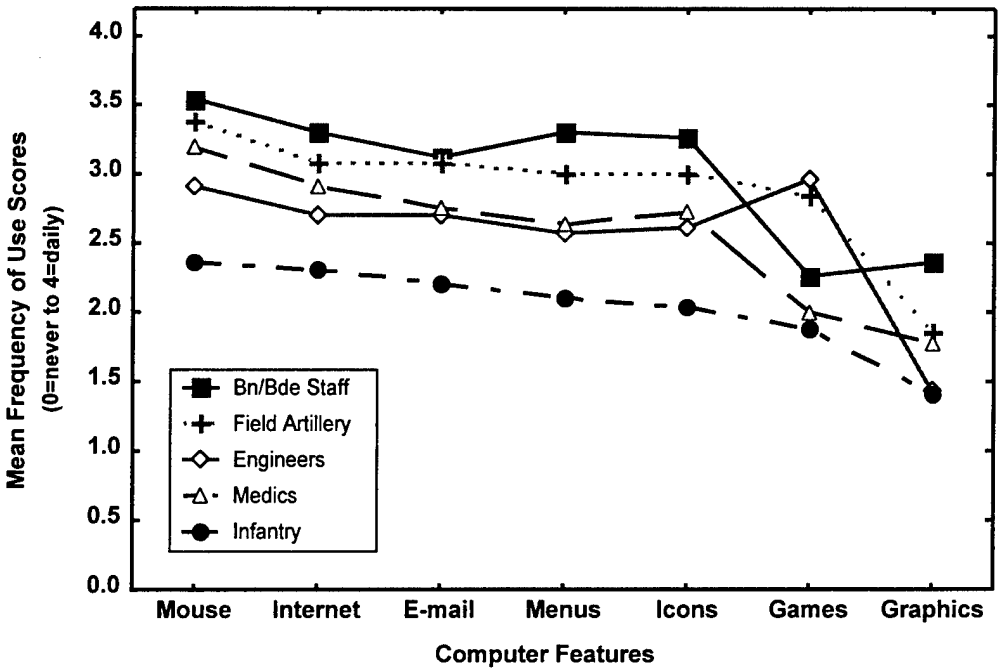

Figure 8. Interaction between battalion element and use of computer features.

Self-ratings of skill. The six-point, self-rating scale asked soldiers to evaluate whether they were computer novices, good with one software application package, good with several software packages, could program in one language, could program in several languages, or good enough for Bill Gates to hire them. Soldiers' ratings of their computer skill by rank are illustrated in Figure 9. The decrease in the percentage of novice ratings as the rank increases is clear in this graph. Nearly half the E4s and below rated themselves as novices. The corresponding percentages for the E5s and E6s-E9s were 41% and 31%. Few officers (6%) rated themselves as novices. Fifty-four percent of the officers rated themselves good with several software programs. The corresponding rating for the other groups was from 27% to 35%, with the exception of the E3s, where only 19% felt they were good with several software programs. For graphic purposes, all the rating categories involving programming skills were combined (see Tables A-20 and A-22 for all frequencies and means). Figure 9 also illustrates that officers had the greatest percentage of individuals with programming skills.

Analysis of the mean ratings showed that the officers rated themselves higher than each of the enlisted groups, $F(5, 680) = 12.19$, $p < .0000$. Also, the E6-E9 NCOs rated themselves significantly higher than the E3 soldiers.

Self-ratings of computer skills by battalion element are illustrated in Figure 10. Infantry soldiers had the greatest percentage of novice ratings (50%) followed by medics (47%), engineers (43%), artillery (29%), and staff members (24%). Table A-21 presents all the rating percentages. Analysis of mean ratings, $F(4, 681) = 9.17$, $p < .0000$), showed that the staff members rated themselves significantly higher than the infantry and medics (see Table A-23 for descriptive statistics).

Soldiers' free-response answers to what software programs they use and their programming skills also provide insight into their skill and experience. With regard to software programs, only non-novices should have answered this question. In general, about 38% of these "non-novice" individuals named general office software (e.g., Microsoft Office), word processing, spreadsheet, graphics, and/or some type of operating system (see Table A-35). Within these categories, Microsoft Office products predominated (see Table A-36). Except for graphics, at least 85% of those who listed software in these categories cited a Microsoft Office product (e.g., Word, Excel, Microsoft Office, Microsoft Works). For graphics, the percentage for Power Point was 69%. These specific software percentages were fairly consistent across battalion element except for graphics. In this category, the percentage of field artillery and engineers using Power Point was lower, at 38%.

Even fewer soldiers (n = 82) had programming skills, and only 55% responded by listing specific programming languages (see Table A-37). The most commonly listed programming languages were BASIC and C++ (see Table A-38).

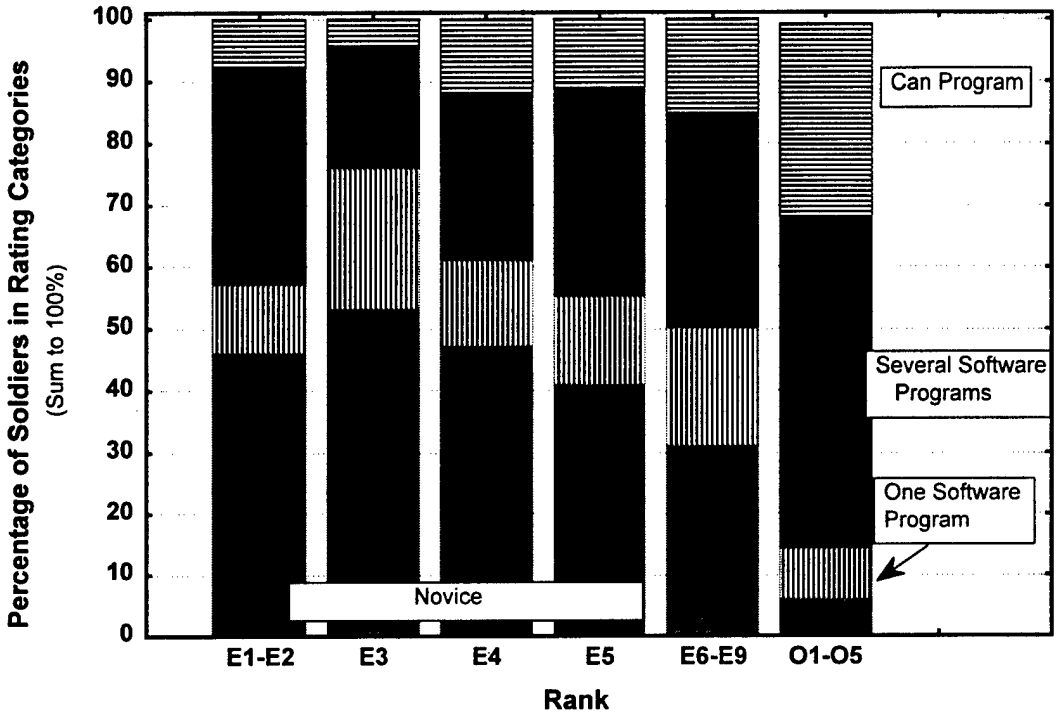

Figure 9. Self-ratings of computer skill by rank.

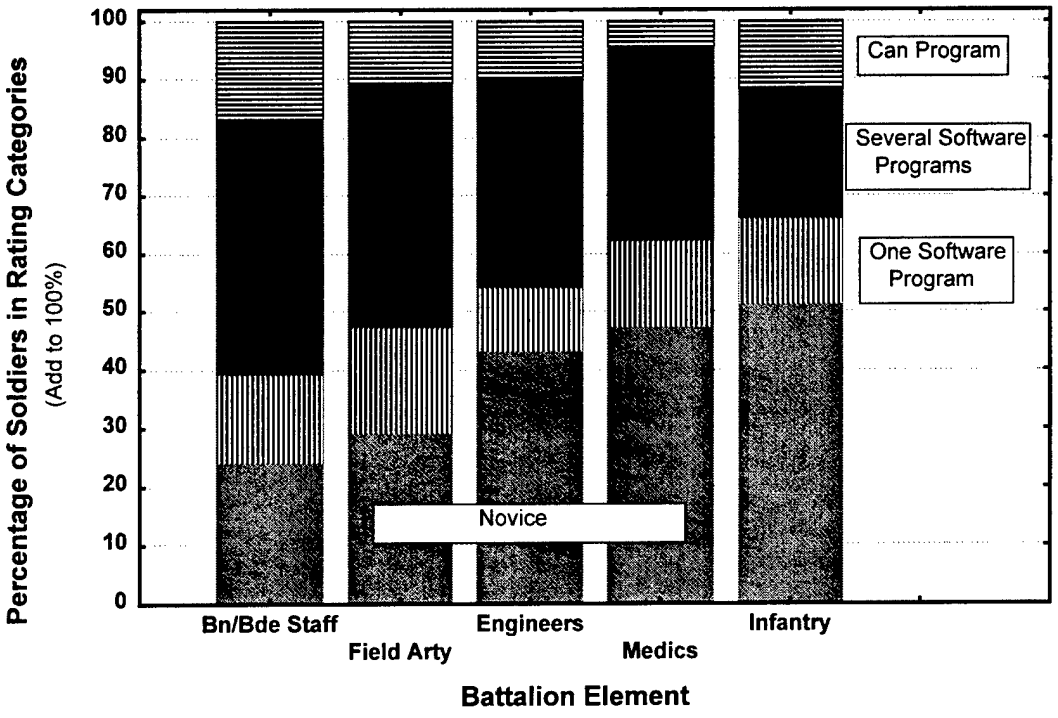

Figure 10. Self-ratings of computer skill by battalion element.

Icon Test Scores

Besides the subjective ratings of skill, the soldiers also completed a test of 18 Windows-based and common computer icons (see survey in Appendix C). The icon test was an objective measure or index of computer experience and expertise, and provided a "check" on the subjective items in the survey.

The icon score results reflected the self-reported expertise indicated by the other survey measures. Figure 11 is a box plot of the icon scores by rank, illustrating the diversity of the scores as well as where the scores were concentrated. Significant differences in the mean icon scores occurred among the soldier ranks, $F(5, 685) = 29.99$, $p < .01$. The groups ordered from high to low as follows: officers ($M = 13.14$); E6-E9 ($M = 10.97$); E5 ($M = 9.36$); E4 ($M = 8.29$); E1-E2 ($M = 6.66$); and E3 ($M = 6.05$). Complete descriptive statistics are in Table A-24. Post hoc comparisons revealed that the officers scored significantly higher than all other ranks except the E6-E9 group. The E4 and E5 groups were equivalent to each other. The E1-E2 group and the E3 group scored significantly lower than all groups except each other. Figure 11 also illustrates less diversity of scores for the officer sample than the other groups.

When the icon scores were analyzed by battalion element, the staff members ($M = 11.19$) had the highest scores, and they scored significantly higher than the infantry, medics and engineers, $F(4, 686) = 20.58$, $p < .0000$. The other groups ordered from highest to lowest as follows: field artillery ($M = 9.04$); engineers ($M = 8.14$); medics ($M = 7.80$); and infantry ($M = 7.41$). Figure 12 illustrates this order and the spread within the groups. Descriptive statistics are presented in Table A-25.

The percentage of soldiers who identified each icon correctly was also determined (see Tables A-26-28). We classified icons by three level of difficulty: easy (at least 75% of the soldiers identified it correctly), of intermediate difficulty (between 24% and 74% identified it correctly), and hard or difficult (25% or fewer soldiers answered it correctly). For all soldiers, only one icon was classified as easy --- recycle. Five were hard --- paste, fill, new file, group, and draw arrow. The remaining 12 were of intermediate difficulty. Examination of the icons by soldier rank showed that the officer group scored the highest on each icon, except for "close." These results are consistent with the high mean for the officer group.

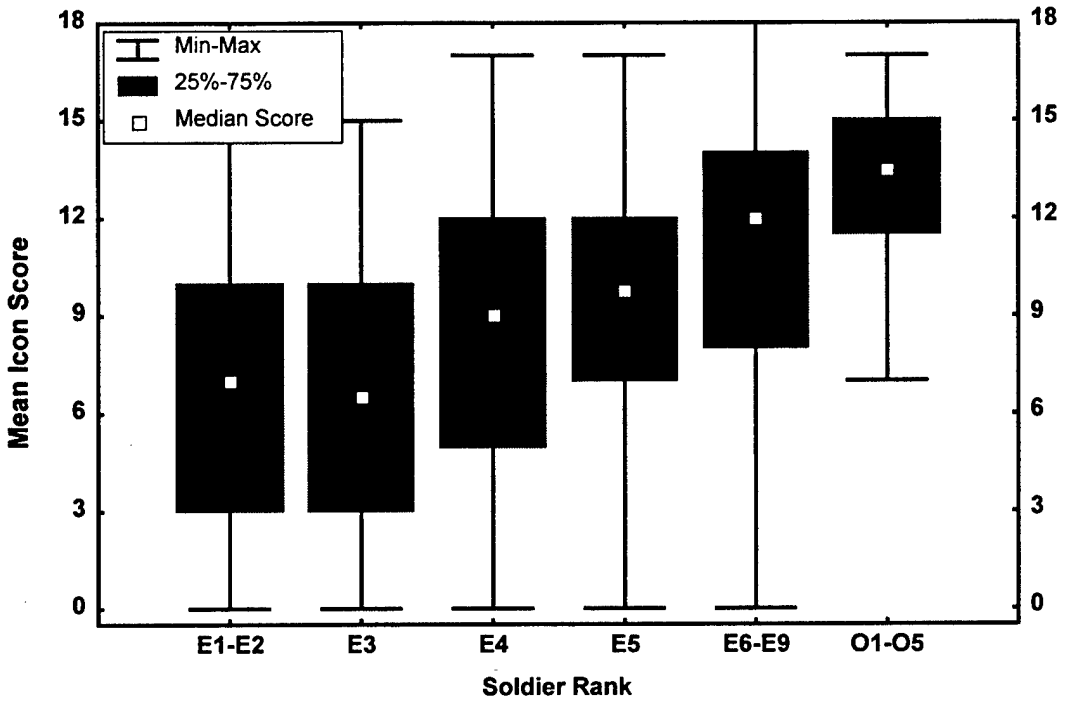

Figure 11. Icon scores by soldier rank.

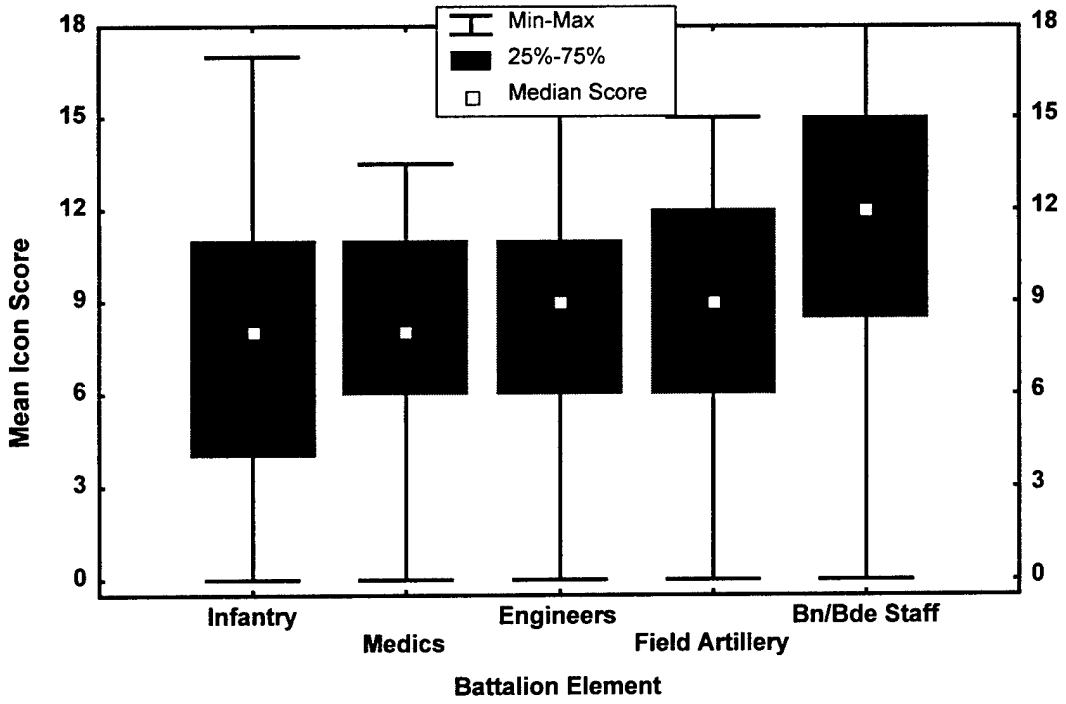

Figure 12. Icon scores by battalion element.

Relationships Among Indices of Computer Skill

A question of interest was whether the survey measures intended to assess computer backgrounds related to the self-ratings and the icon test scores. Across all soldiers, the frequency of using common computer features correlated most highly with the icon scores, r=.61 (see Table 2, All Soldiers column). Three other variables had similar correlations with the icon score, self-rating (r=.45), owning a computer (r=.43), and using a computer (r=.47). The number of educational settings where a computer was used did not correlate significantly with the icon score (r=.07). In general, the relationships that occurred for the entire sample were typical of each battalion element and soldier rank (Tables 2 and 3). Similar relationships occurred between the self-ratings and the background variables. These correlations are in Tables A-30 and A-31.

Table 2
Correlations With Icon Test Scores by Battalion Element

	Battalion Element					
Variable	Bn & Bde Staff (n =163)	Field Artillery (n = 55)	Engineers (n = 61)	Medics (n = 70)	Infantry (n = 342)	All Soldiers (n=691)
Use of Computer Features (Sum)	.56**	.48**	.55**	.50**	.61**	.61**
Self-Rating	.34**	.41**	.53**	.45**	.42**	.45**
Own a Computer	.37**	.43**	.36**	.41**	.50**	.43**
Use a Computer	.40**	.48**	.44**	.41**	.47**	.47**
# Education Settings Where Used a Computer	.04	.10	.16	.12	.14*	.07

Note. * $p < .05$, ** $p < .01$.

Table 3
Correlations With Icon Test Scores by Rank

	Soldier Rank					
Variable	E1-E2 (n =120)	E3 (n = 106)	E4 (n = 220)	E5 (n = 98)	E6-E9 (n = 99)	O1-O6 (n=48)
Use of Computer Features (Sum)	.58**	.50**	.59**	.49**	.52**	.34**
Self-Rating	.43**	.40**	.43**	.38**	.35**	.03
Own a Computer	.43**	.29**	.39**	.38**	.20	.04
Use a Computer	.42**	.39**	.49**	.29**	.50**	*a*
# Education Settings Where Used a Computer	.42**	.23*	.11	.14	.10	.08

Note. * $p < .05$, ** $p < .01$.
[a] No correlation was possible because all individuals reported using a computer.

Results for the Specialists in Each Battalion Element

The battalion and brigade staff members rated themselves higher and scored higher on the icon score than the other battalion elements. However, age, rank, and other possible factors were not controlled for in that grouping. Some of these factors can be controlled by examining the indices of computer expertise by battalion element using only one rank. The soldier rank with the greatest number was that of specialist or E4. Therefore, some of the key analyses were conducted using only these soldiers. Any observed effects across battalion element would provide support for job type as a factor in gaining computer expertise. Descriptive statistics on the specialists, by battalion element, are in Tables B-1 through B-12.

Participants

The data from the specialists were analyzed by battalion element. The first analyses were conducted to determine whether any key background variables differed across battalion element. The mean age of the soldiers was 23.59 (*SD*=3.29). Table 4 presents the mean ages and standard deviations for these soldiers by battalion element. There was no significant difference in the ages of the specialists in the various battalion elements.

Table 4
Descriptive Statistics for Age of Specialists by Battalion Element

Element	*N*	*M*	*Mdn*	*SD*	Min & Max Values	Lower & Upper Quartiles (25^{th} –75^{th})
Bn/Bde Staff	49	24.08	23	3.19	20-36	21.5-26
Field Artillery	13	23.08	22	4.23	20-36	20.5-24
Engineers	23	24.26	23	3.82	19-32	21-27
Medics	32	23.94	23	3.70	20-37	21-26
Infantry	102	23.17	22	2.92	20-33	21-25

It is noted that the largest numbers of specialists were in the staff and infantry elements. In addition, in the previous analyses there were large differences between staff and infantry elements. Therefore, in the results that follow, more definitive statements are made about specialists in the staff and infantry than those in the other battalion elements (field artillery, engineers, and medics).

Computer Use

A basic question was whether the opportunity afforded individuals to use computers on the job (i.e., staff members) would be related to computer expertise when compared to individuals having less opportunity to use computers on the job (i.e., infantry). Because the specialists were of similar ages across the elements, it was not expected that formal educational settings would differ. Figure 13 presents the educational settings where a computer was used across battalion element. Examination of the percentages reveals little difference across the

elements. Analysis of the mean number of settings where computers were used showed no significant difference among the specialists in the different battalion elements.

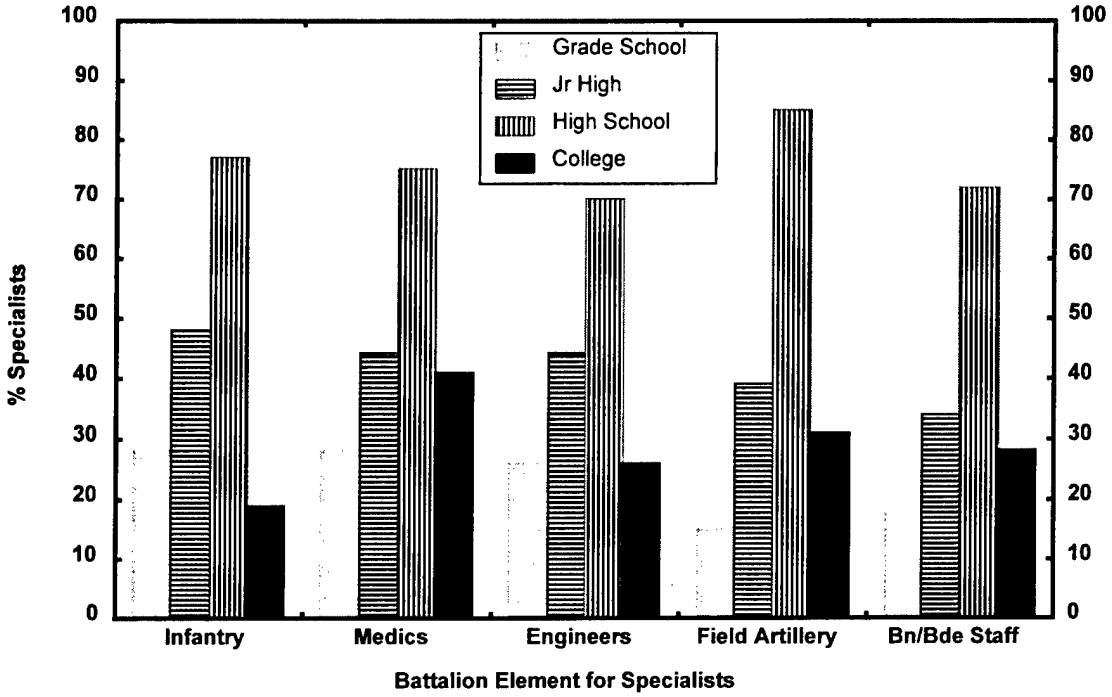

Figure 13. Percentage of specialists using a computer in school.

As with the total group, computer ownership, usage, and where computers are used were examined. Figure 14 depicts these factors. There was no significant difference in ownership, $F(4, 215) = 1.23$, $p < .2974$. However, there was a significant difference in usage rate, $F(4, 215) = 5.48$, $p < .0003$, with more specialists in the staffs (98%) using a computer than those in the infantry (72%). Figure 14 reveals that 84% of the staff members used a computer at work contrasting to only 16% of the infantry soldiers. However, in these two elements, the percentage of specialists who used computers at home was similar (62% for staff and 59% for infantry). Even though more definitive statements are difficult to make regarding the other elements, for the engineers and field artillery, the home and unit use patterns are similar to the infantry. The high rate of unit use cited by the medics shown in Figure 14 conflicts with other indices of skill (e.g., self-ratings and icon scores). Specialists in the staff also used computer features more frequently than specialists in the infantry, $F(4, 215) = 6.31$, $p < .0000$. Specialists in the staffs were more likely to use features on a daily or weekly basis, while those in the infantry used them on a weekly or monthly basis (see Tables B-5 and B-6).

While the backgrounds of the specialists were very similar, computer usage differed among the elements, particularly between the staff and infantry. The greatest difference is reflected in the opportunity to use a computer as an integral part of one's duty position when assigned to a battalion or brigade staff. This opportunity is not available to those specialists within an infantry company, nor apparently to those within the engineer and field artillery units.

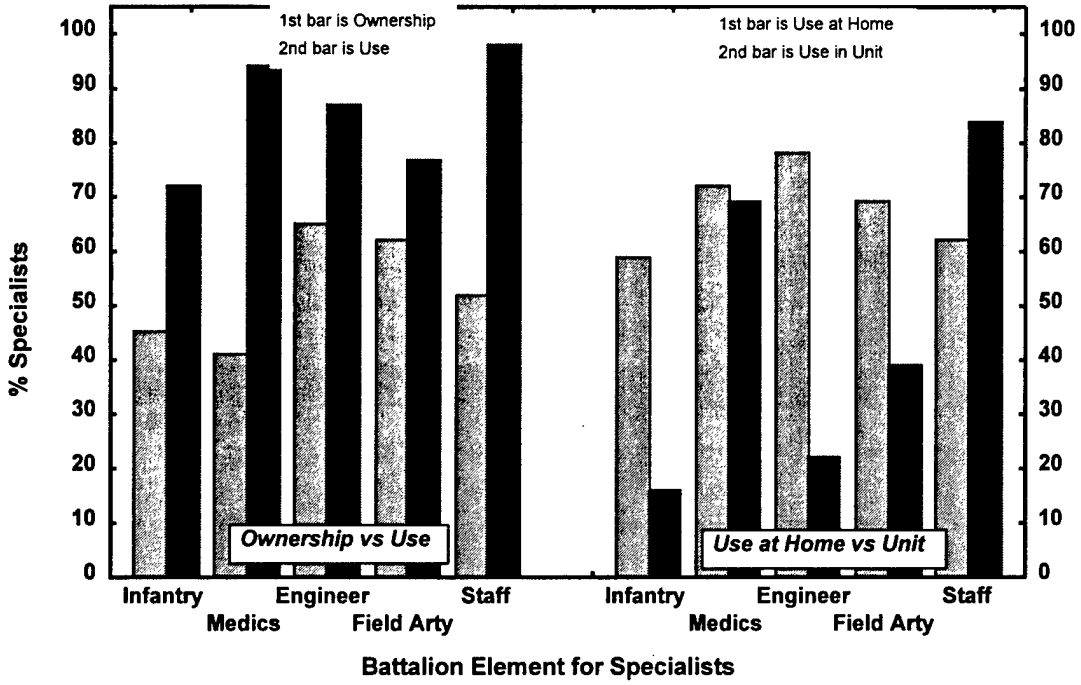

Figure 14. Computer ownership and use, and home and work use for specialists

Indices of Skill

Would the higher usage rates, both at home and at work, by the specialists in staff elements translate into higher self-ratings and higher icon scores? Soldiers' ratings of their computer skill are displayed in Figure 15. There was a significant difference among the groups, $F(4, 214) = 3.74$, $p < .0058$, with the self-ratings from the specialists in the staff higher than those in the infantry. More than half of the infantry (58%) rated themselves as a novice contrasting to 26% of the staff members. In addition, more than half of the staff (58%) rated themselves good with several programs or could program whereas only 29% of the infantry rated themselves that high. One argument for the higher self-ratings for staff over the infantry is that the staff is composed of soldiers from several branches. In turn, these branches may afford different training opportunities or have soldiers with different computer backgrounds. Of the 49 staff members, 24 were infantry. Of these infantry specialists, 25% rated themselves as a novice and 63% rated themselves as good with at least several programs or could program. Therefore, at the specialist level, the staff members from the infantry rated themselves similarly to staff members from other branches.

The results on the icon scores paralleled the trends on self-ratings (see Figure 16). There was a significant difference in mean icon scores among the battalion elements, $F(4, 215) = 5.36$, $p < .01$. Again, the two extremes were the staff and infantry elements. Post hoc comparisons revealed that the staff members scored higher than the infantry ($M = 10.72$ and 7.19 respectively). The 24 specialists from the infantry on the staff had an icon mean score of 12.71, which contributed to the higher overall mean for specialists on the staff.

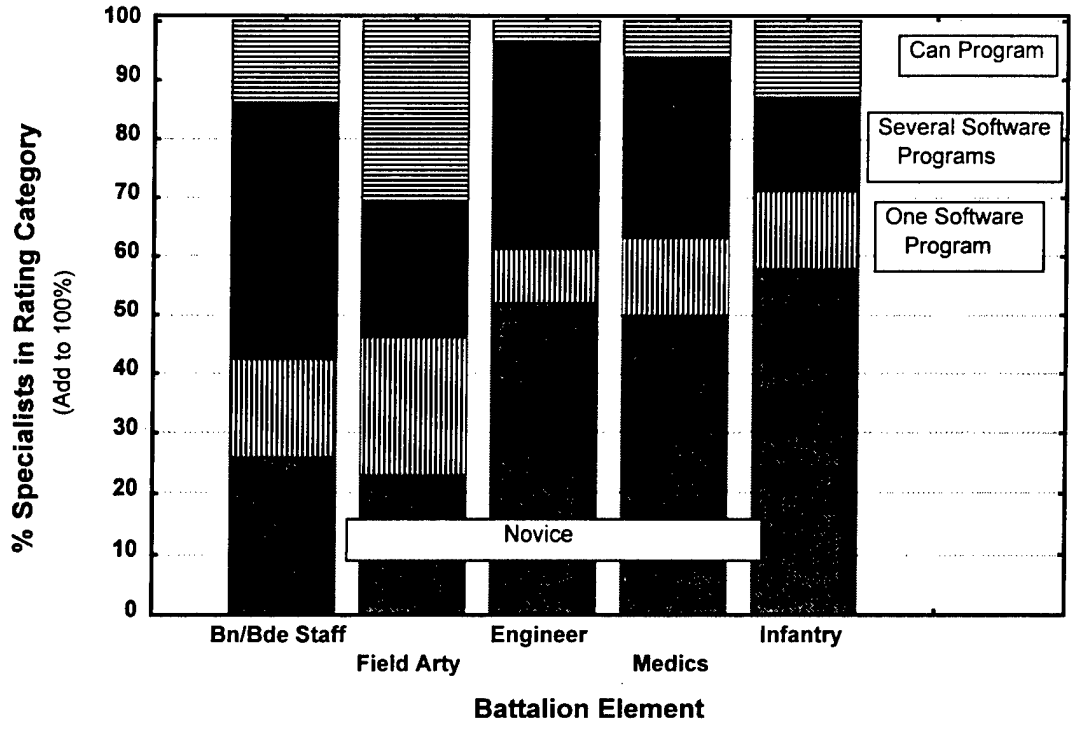

Figure 15. Self-ratings of computer skill for specialists by battalion element.

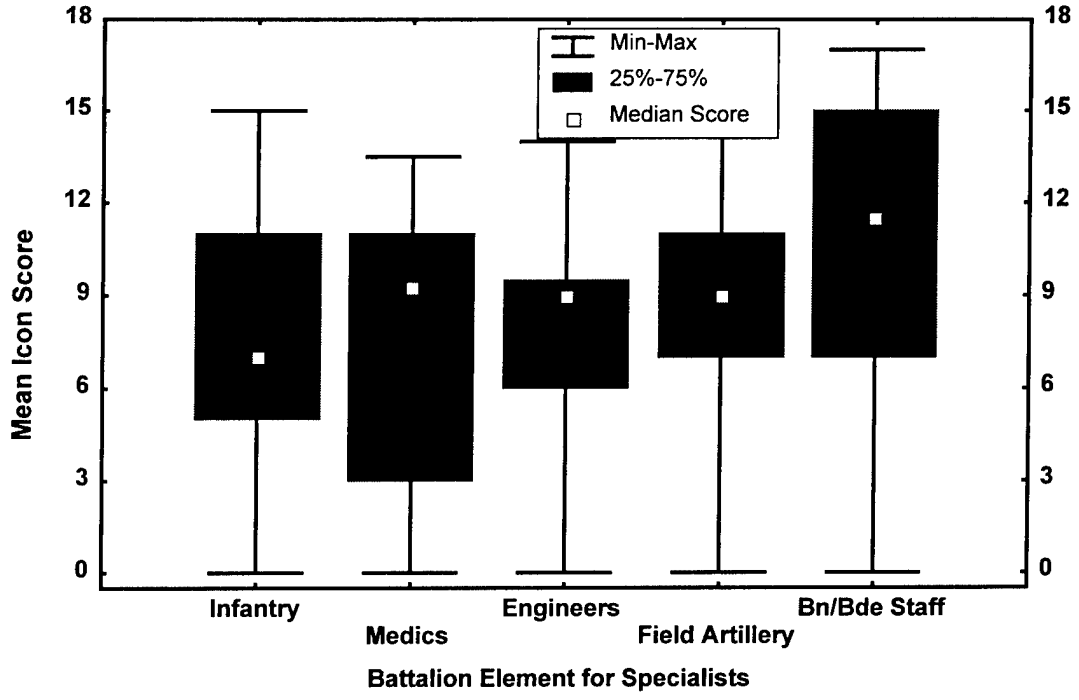

Figure 16. Icon scores for specialists by battalion element.

Descriptions in Appendix B on the software and computer programming experience of specialists in staff positions versus those in infantry positions show different profiles of use and experience, which in turn were reflected in the self-ratings and icon scores. Of those who rated themselves as non-novices, specialists in staff positions were more likely to list word processing, spreadsheet and graphics software packages (see Table B-11). Typically 45% to 60% of specialists in staff positions cited experience with these types of software. In contrast, 5% to 36% of specialists in infantry unit positions listed similar experience.

Summary

The findings are similar to those reported by Dyer and Martin (1999) and Fober, et al. (2000) on soldiers enrolled in infantry courses taught at Fort Benning, Georgia. The picture presented on soldiers' computer backgrounds, their perceptions of their skill, and an objective index of skill/knowledge is consistent. The subjective, self-report indices agreed with the objective icon test. Soldiers using computers features more frequently reported a higher index of skill and performed better on the icon test. Soldiers' expertise was not necessarily related to use of computers in school. As rank increased, computer proficiency, computer ownership, and use of computers increased. The officer group, across all elements, scored the highest on the icon test of any subgroup surveyed to date. The findings do not support the assumptions that senior NCOs have poor computer skills, and that all of today's youth are computer literate.

With respect to Army branch/battalion element, the general picture was that the most expertise was in the staff elements, followed by field artillery, then engineers, then medics, and then infantry. This picture is qualified, however, by the fact that not all ranks were equally distributed across these elements.

The analysis of the soldiers at the rank of specialist controlled for rank, age, use of computers in school, and computer ownership, and is therefore of particular interest. With the specialists, the indices of computer expertise did differ across battalion element. The biggest difference related to use of computers at work. Five times as many specialists within the battalion/brigade staffs reported using computers at work or in their unit, compared to infantrymen at the specialist rank. Presumably, the additional opportunity for computer use at work resulted in more frequent use overall, more use of computer features, higher self-ratings, and higher icon test scores. This argument is further supported by the high self-ratings and the high icon test scores of the infantry branch specialists occupying staff positions. Their backgrounds were similar to the specialists in the rifle companies with the exception of their use of computers at work.

The results of this survey indicate a large portion of the population sampled has limited computer expertise. Although the data come from a survey instrument, there are multiple indications that many soldiers lack fundamental computer skills. The relationships among self-ratings, use of computer features, and the icon test scores are strong. As a whole, they indicate that some soldiers may require basic computer training prior to training on digital systems. This converging evidence points to the need to train basic computer skills for segments of the Army population. It does not necessarily mean that soldiers can not learn new digital systems without

strong computer backgrounds, but basic computer skills should facilitate the learning of systems like the Land Warrior. In the case of the Land Warrior, much of the software is accessed via icons in a Windows-based environment. Obviously, extensive experience with Windows should accelerate training and mastery of Land Warrior computer functions.

The results of this survey indicate a diverse population, one that has individuals with limited computer skills to individuals with programming skills. Because of this diversity, any training on digital systems must be flexible enough to train individuals from both ends of the spectrum. If the present findings remain stable, many soldiers would benefit from basic computer training prior to learning to operate computer subsystems within tactical systems like the Land Warrior and the BFVA3.

The implications from the specialists' findings indicate that the type of opportunity provided to soldiers to use computers may play an important role in learning basic computer skills. That is, although overall use of computers at home was high for all specialists, those specialists (i.e., staff members) with high use in a work environment scored higher on both subjective and objective measures of computer expertise than those specialists (i.e., infantry) with low use in a work environment. The skills required by the Army's digital systems might be most effectively trained by providing soldiers with some of the basic computer skills to get started, and then afford them the opportunity to practice those skills. The need for a total force with computer skills is continually growing with the increase in systems requiring computer expertise. Taking simple measures now to insure properly trained individuals will pay off in the future.

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Appendix A

Data Tables for All Soldiers

Table A-1
Number of Soldiers by Each Rank in Each Battalion Element

Rank	Battalion Element					
	Bn & Bde Staff	Field Artillery	Engineers	Medics	Infantry	All Elements
Private	10	12	13	7	78	120
Private 1st Class	13	10	5	11	67	106
Specialist/Corporal	50	13	23	32	102	220
Sergeant	14	6	13	11	54	98
Staff Sergeant	25	8	3	6	22	64
Sergeant 1st Class	14	3	1	2	6	26
First Sergeant	4	0	0	0	3	7
Sergeant Major	2	0	0	0	0	2
2d Lieutenant	1	0	2	1	0	4
1st Lieutenant	12	2	1	0	7	22
Captain	11	1	0	0	3	15
Major	5	0	0	0	0	5
Lieutenant Colonel	2	0	0	0	0	2

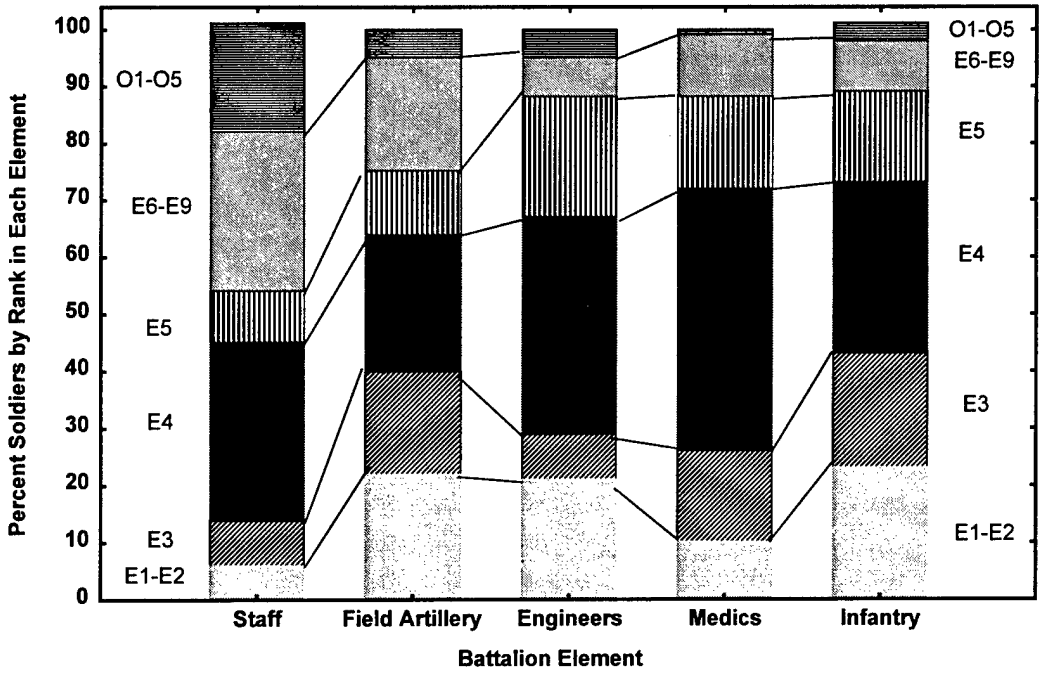


Figure A-1. Relative distribution of ranks in each battalion element.

Table A-2
Descriptive Statistics on Age in Years by Rank

Rank	*N*	*M*	*Mdn*	*SD*	Min & Max Values	Lower & Upper Quartiles (25^{th}-75^{th})
E1-E2	120	20.29	20	2.22	18-34	19-21
E3	106	21.01	20	2.07	19-30	20-22
E4	219	23.59	23	3.29	19-37	21-25
E5	96	26.85	26	3.27	20-37	25-29
E6-E9	97	33.81	34	5.12	23-49	30-37
O1-O5	46	28.54	27	4.65	22-40	25-30.5

Note. $F(5,683) = 226.69$, $p < .0001$. The ages of all groups differed except those with ranks of E1-E2 and E3, and the officers and those with a rank of E5.

Table A-3
Descriptive Statistics on Age by Battalion Element

Battalion Element	*N*	*M*	*Mdn*	*SD*	Min & Max Values	Lower & Upper Quartiles (25^{th}-75^{th})
Bn & Bde Staff	157	28.13	27	6.90	18-49	23-34
Field Artillery	55	24.38	23	5.52	18-40	20-26
Engineers	61	24.13	23	4.54	18-38	21-27
Medics	69	25.01	24	5.40	18-43	21-27
Infantry	342	23.52	22	4.36	18-39	20-26

Note. $F(4,679) = 21.08$, $p < .0001$. The staff members were older than each of the other groups.

Table A-4
Descriptive Statistics on Months Served in the Army by Rank

Rank	*N*	*M*	*Mdn*	*SD*	Min & Max Values	Lower & Upper Quartiles (25^{th}-75^{th})
E1-E2	120	15.92	10	13.16	5-96	8-21
E3	106	20.34	19	9.71	6-72	16-23
E4	220	38.82	34	18.09	6-103	29-44
E5	98	78.76	76	34.80	18-163	50-104
E6-E9	99	161.79	162	52.31	56-292	123-200
O1-O5	48	69.77	58	57.66	11-226	24-82

Table A-5
Descriptive Statistics on Months Served in the Army by Battalion Element

Battalion Element	***N***	***M***	***Mdn***	***SD***	**Min & Max Values**	**Lower & Upper Quartiles (25^{th}-75^{th})**
Bn & Bde Staff	163	86.40	57	74.62	0-292	25-144
Field Artillery	55	53.13	31	57.47	6-222	16-64
Engineers	61	50.26	41	43.21	5-218	18.5-69
Medics	70	54.09	37	45.17	7-204	24.5-73.5
Infantry	342	46.25	31	44.79	5-216	19-57

Table A-6
Percentage of Soldiers Using a Computer in Different Phases of Their Formal Education by Rank

	% Use Computer					
Rank	Grade School	Junior High	High School	Technical School	College	Not Use
E1-E2	39%	58%	83%	10%	13%	1%
E3	35%	53%	80%	7%	19%	9%
E4	25%	43%	75%	7%	26%	8%
E5	13%	30%	61%	3%	34%	16%
E6-E9	4%	8%	23%	7%	33%	44%
O1-O5	17%	42%	65%	0%	81%	4%

Table A-7
Percentage of Soldiers Using a Computer in Different Phases of Their Formal Education by Battalion Element

	% Use Computer					
Battalion Element	Grade School	Junior High	High School	Technical School	College	Not Use
Bn & Bde Staff	17%	27%	55%	0%	39%	22%
Field Artillery	25%	47%	75%	11%	36%	9%
Engineers	28%	43%	69%	0%	26%	10%
Medics	30%	41%	69%	11%	40%	10%
Infantry	25%	45%	71%	0%	20%	11%

Table A-8
Number of Educational Settings Where Soldiers Used a Computer by Rank

Rank	# Educational Settings Used a Computer (% soldiers)					
	0	1	2	3	4-5	*M* Settings
E1-E2	1%	40%	23%	28%	8%	2.03
E3	9%	35%	24%	21%	12%	1.93
E4	8%	43%	23%	16%	10%	1.75
E5	16%	50%	17%	9%	7%	1.41
E6-E9	44%	42%	8%	4%	1%	0.76
O1-O5	4%	38%	25%	17%	17%	2.04

Table A-9
Number of Educational Settings Where Soldiers Used a Computer by Battalion Element

Battalion Element	# Educational Settings Used a Computer (% soldiers)					
	0	1	2	3	4-5	*M* Settings
Bn & Bde Staff	22%	42%	17%	12%	7%	1.40
Field Artillery	9%	35%	24%	18%	15%	1.95
Engineers	10%	43%	23%	15%	10%	1.74
Medics	10%	37%	23%	13%	17%	1.91
Infantry	11%	44%	21%	19%	6%	1.66

Table A-10
Percentage of Soldiers by Rank Indicating Computer Ownership and Current Use of a Computer

Rank	% Own a Computer	% Use Computer Now	Where Currently Use Computer		
			Home	Work/ Unit	Trng Facility
E1-E2	23%	72%	47%	14%	33%
E3	28%	76%	57%	14%	37%
E4	49%	83%	64%	41%	21%
E5	67%	94%	75%	43%	28%
E6-E9	83%	94%	79%	84%	27%
O1-O5	96%	100%	94%	98%	23%

Table A-11
Percentage of Soldiers by Battalion Element Indicating Computer Ownership and Current Use of a Computer

Battalion Element	% Own a Computer	% Use Computer Now	Where Currently Use Computer		
			Home	Work/ Unit	Trng Facility
Bn & Bde Staff	66%	96%	72%	86%	23%
Field Artillery	60%	85%	75%	40%	44%
Engineers	61%	82%	72%	25%	23%
Medics	43%	90%	66%	60%	43%
Infantry	44%	77%	60%	22%	25%

Table A-12
Percentage of Soldiers by Rank Indicating Different Levels of Typing Skill

Rank	Self Ratings of Typing Skill			
	Hunt & Peck Slowly	Hunt & Peck Quickly	Type Slowly	Type Quickly
E1-E2	16%	40%	24%	20%
E3	15%	39%	29%	17%
E4	16%	41%	26%	18%
E5	13%	41%	26%	20%
E6-E9	17%	40%	20%	22%
O1-O5	2%	25%	31%	42%

Table A-13
Percentage of Soldiers by Battalion Element Indicating Different Levels of Typing Skill

Battalion Element	Self Ratings of Typing Skill			
	Hunt & Peck Slowly	Hunt & Peck Quickly	Type Slowly	Type Quickly
Bn & Bde Staff	10%	34%	29%	26%
Field Artillery	2%	44%	18%	36%
Engineers	21%	43%	18%	18%
Medics	13%	47%	27%	13%
Infantry	18%	38%	26%	18%

Table A-14
Frequency With Which Computer Features are Used: Percentage Soldiers by Rank

Group	Frequency (% Soldiers)				
	Daily	**Weekly**	**Monthly**	**< Monthly**	**Never**
	Mouse				
E1-E2	28%	23%	12%	21%	17%
E3	34%	14%	14%	20%	18%
E4	49%	23%	6%	11%	11%
E5	66%	13%	8%	8%	4%
E6-E9	77%	13%	4%	4%	2%
O1-O5	94%	0%	0%	4%	2%
	Games				
E1-E2	17%	22%	16%	20%	26%
E3	23%	22%	12%	29%	14%
E4	24%	26%	11%	19%	20%
E5	33%	16%	11%	25%	15%
E6-E9	19%	24%	13%	30%	13%
O1-O5	13%	29%	15%	23%	21%
	Icons				
E1-E2	18%	20%	10%	23%	28%
E3	23%	18%	18%	18%	24%
E4	36%	26%	8%	15%	16%
E5	55%	17%	6%	10%	11%
E6-E9	66%	15%	5%	9%	5%
O1-O5	92%	6%	0%	2%	0%
	Menus				
E1-E2	21%	18%	11%	25%	26%
E3	22%	19%	17%	19%	24%
E4	41%	20%	9%	16%	16%
E5	49%	21%	8%	12%	9%
E6-E9	65%	12%	7%	9%	7%
O1-O5	96%	2%	0%	2%	0%

Table A-14 (cont.)
Frequency With Which Computer Features are Used: Percentage Soldiers by Rank

Group	Frequency (% Soldiers)				
	Daily	Weekly	Monthly	< Monthly	Never
	Graphics				
E1-E2	14%	13%	13%	28%	32%
E3	11%	9%	15%	32%	32%
E4	18%	16%	14%	26%	27%
E5	13%	21%	17%	30%	18%
E6-E9	26%	28%	8%	24%	13%
O1-O5	44%	19%	25%	8%	4%
	E-Mail				
E1-E2	25%	21%	9%	18%	28%
E3	25%	20%	10%	12%	33%
E4	46%	15%	10%	13%	17%
E5	54%	16%	6%	9%	14%
E6-E9	60%	14%	6%	10%	10%
O1-O5	98%	0%	0%	2%	0%
	Internet				
E1-E2	26%	22%	11%	20%	22%
E3	27%	20%	18%	14%	21%
E4	46%	20%	8%	14%	13%
E5	57%	18%	6%	9%	9%
E6-E9	55%	22%	5%	11%	7%
O1-O5	73%	23%	2%	2%	0%

Table A-15
Frequency With Which Computer Features are Used: Percentage Soldiers by Battalion Element

Group	Frequency (% Soldiers)				
	Daily	**Weekly**	**Monthly**	**< Monthly**	**Never**
	Mouse				
Bn & Bde Staff	75%	13%	4%	4%	4%
Field Artillery	58%	26%	6%	7%	4%
Engineers	57%	16%	8%	7%	12%
Medics	47%	31%	6%	10%	6%
Infantry	42%	15%	10%	18%	15%
	Games				
Bn & Bde Staff	22%	28%	13%	20%	17%
Field Artillery	35%	29%	7%	22%	7%
Engineers	41%	20%	13%	13%	13%
Medics	20%	21%	11%	27%	20%
Infantry	18%	21%	13%	26%	22%
	Icons				
Bn & Bde Staff	63%	19%	5%	6%	7%
Field Artillery	47%	31%	6%	9%	7%
Engineers	51%	16%	5%	10%	18%
Medics	36%	26%	6%	20%	12%
Infantry	30%	17%	12%	19%	22%
	Menus				
Bn & Bde Staff	65%	15%	6%	8%	7%
Field Artillery	51%	22%	7%	15%	6%
Engineers	46%	18%	8%	10%	18%
Medics	36%	21%	9%	21%	13%
Infantry	32%	16%	12%	19%	21%

Table A-15 (cont.)
Frequency With Which Computer Features are Used: Percentage Soldiers by Battalion Element

Group	Frequency (% Soldiers)				
	Daily	Weekly	Monthly	< Monthly	Never
	Graphics				
Bn & Bde Staff	30%	20%	16%	20%	14%
Field Artillery	29%	29%	7%	18%	16%
Engineers	18%	13%	23%	18%	28%
Medics	16%	16%	17%	30%	21%
Infantry	12%	14%	13%	32%	30%
	E-Mail				
Bn & Bde Staff	61%	15%	5%	8%	12%
Field Artillery	55%	16%	9%	6%	15%
Engineers	49%	15%	7%	12%	18%
Medics	43%	16%	16%	9%	17%
Infantry	37%	16%	8%	16%	23%
	Internet				
Bn & Bde Staff	60%	19%	9%	6%	7%
Field Artillery	49%	24%	7%	7%	13%
Engineers	49%	18%	5%	13%	15%
Medics	39%	24%	13%	16%	9%
Infantry	36%	21%	9%	17%	18%

Table A-16

Means (standard deviations) by Rank on the Computer Features Frequency of Use Scales

Feature	Soldier Rank						
	E1-E2 (*n*=120)	E3 (*n*=106)	E4 (*n*=220)	E5 (*n*=98)	E6-E9 (*n*=99)	O1-O5 (*n*=48)	All Groups (*n*=691)
Mouse	2.25 (1.48)	2.26 (1.54)	2.87 (1.42)	3.30 (1.17)	3.59 (0.90)	3.79 (0.82)	2.90 (1.42)
Internet	2.10 (1.53)	2.19 (1.50)	2.71 (1.48)	3.05 (1.36)	3.06 (1.30)	3.67 (0.63)	2.69 (1.47)
Menus	1.83 (1.51)	1.96 (1.49)	2.55 (1.52)	2.89 (1.38)	3.18 (1.30)	3.92 (0.45)	2.57 (1.53)
Icons	1.77 (1.50)	1.98 (1.49)	2.53 (1.48)	2.95 (1.43)	3.27 (1.21)	3.88 (0.49)	2.57 (1.52)
E-mail	1.98 (1.58)	1.91 (1.62)	2.60 (1.56)	2.87 (1.50)	3.03 (1.41)	3.94 (0.43)	2.58 (1.59)
Games	1.83 (1.45)	2.09 (1.41)	2.15 (1.48)	2.27 (1.51)	2.06 (1.36)	1.90 (1.37)	2.07 (1.59)
Graphics	1.49 (1.41)	1.36 (1.33)	1.71 (1.46)	1.82 (1.33)	2.30 (1.42)	2.90 (1.19)	1.80 (1.44)
All Features	1.89 (1.49)	1.96 (1.48)	2.45 (1.49)	2.74 (1.38)	2.93 (1.27)	3.43 (0.77)	2.45 (1.51)

Note. Scale was 0 = never use, 1 = less than monthly, 2 = monthly, 3 = weekly, 4 = daily.

Table A-17

Means (standard deviations) by Battalion Element on the Computer Features Frequency of Use Scales

Feature	Battalion Element					
	Bn & Bde Staff (*n*=163)	Field Artillery (*n*=55)	Engineers (*n*=61)	Medics (*n*=70)	Infantry (*n*=342)	All Bn Elements (*n*=691)
Mouse	3.50 (1.05)	3.27 (1.10)	3.02 (1.41)	3.04 (1.21)	2.50 (1.53)	2.90 (1.42)
Internet	3.20 (1.22)	2.89 (1.42)	2.74 (1.54)	2.69 (1.36)	2.40 (1.54)	2.69 (1.47)
Menus	3.23 (1.26)	2.98 (1.30)	2.64 (1.57)	2.46 (1.48)	2.19 (1.56)	2.57 (1.53)
Icons	3.26 (1.22)	3.02 (1.25)	2.72 (1.59)	2.51 (1.47)	2.16 (1.56)	2.57 (1.52)
E-mail	3.05 (1.43)	2.91 (1.48)	2.66 (1.60)	2.59 (1.53)	2.28 (1.63)	2.58 (1.59)
Games	2.17 (1.43)	2.62 (1.35)	2.62 (1.46)	1.94 (1.45)	1.87 (1.43)	2.07 (1.59)
Graphics	2.33 (1.43)	2.36 (1.48)	1.75 (1.46)	1.74 (1.38)	1.48 (1.36)	1.80 (1.44)
All Features	2.96 (1.29)	2.86 (1.34)	2.59 (1.52)	2.42 (1.41)	2.13 (1.52)	2.45 (1.51)

Note. Scale was 0 = never use, 1 = less than monthly, 2 = monthly, 3 = weekly, 4 = daily.

Table A-18

Descriptive Statistics on the Sum of Feature Use Ratings by Rank

Rank	Sum of Feature Use Ratings					
	N	*M*	*Mdn*	*SD*	Min & Max Values	Lower & Upper Quartiles (25^{th}-75^{th})
E1-E2	120	13.25	13	9.32	0-28	6-21
E3	106	13.75	14	9.14	0-28	5-21
E4	220	17.12	19.5	8.78	0-28	10-25
E5	98	19.13	21.5	8.04	0-28	13-26
E6-E9	99	20.49	22	6.83	0-28	17-25
O1-O5	48	23.98	25	3.82	6-28	23-26

Note. The 7 features were rated on a 0 to 4-point scale, ranging from "never" used to "daily" use. Maximum score was 28 representing daily use of all 7 features; minimum score was 0 indicating a soldier never used any of the 7 features.

Table A-19
Descriptive Statistics on the Sum of Feature Use Ratings by Battalion Element

Battalion Element	Sum of Feature Use Ratings					
	N	*M*	*Mdn*	*SD*	Min & Max Values	Lower & Upper Quartiles (25^{th}-75^{th})
Bn & Bde Staff	163	20.74	23	7.09	0-28	18-26
Field Artillery	55	20.05	22	8.02	0-28	16-26
Engineers	61	18.15	21	9.32	0-28	13-26
Medics	70	16.97	18	7.75	0-28	13-23
Infantry	342	14.88	16	9.21	0-28	7-23

Note. The 7 features were rated on a 0 to 4-point scale, ranging from "never" used to "daily" use. Maximum score was 28 representing daily use of all 7 features; minimum score was 0 indicating a soldier never used any of the 7 features.

Table A-20
Percentage of Soldiers by Rank Indicating Different Levels of Computer Skill

Rank	Self-Ratings of Computer Skill						
	N	Novice	Good w 1 softw program	Good w several Soft Progr	1 Progm Lang + Software	Several Progm Lang+Soft	Bill Gates hire me
E1-E2	118	46%	11%	35%	6%	2%	0%
E3	104	53%	23%	19%	5%	0%	0%
E4	219	47%	14%	27%	11%	1%	0%
E5	98	41%	14%	34%	8%	3%	0%
E6-E9	99	31%	19%	35%	9%	3%	3%
O1-O5	48	6%	9%	54%	27%	2%	2%

Table A-21
Percentage of Soldiers by Battalion Element Indicating Different Levels of Computer Skill

Battalion Element	Self-Ratings of Computer Skill						
	N	Novice	Good w 1 softw program	Good w several Soft Progr	1 Progm Lang + Software	Several Progm Lang+Soft	Bill Gates hire me
Bn & Bde Staff	163	24%	15%	44%	14%	2%	1%
Field Artillery	55	29%	18%	42%	7%	2%	2%
Engineers	61	43%	11%	36%	7%	3%	0%
Medics	70	47%	15%	33%	4%	1%	0%
Infantry	337	51%	15%	22%	10%	2%	0%

Table A-22
Descriptive Statistics on Self-Ratings of Computer Skill by Rank

Rank	Self-Ratings of Computer Skill					
	N	*M*	*Mdn*	*SD*	Range	Interquartile
E1-E2	118	2.07	2	1.10	1-5	1-3
E3	104	1.76	1	0.93	1-4	1-2
E4	219	2.06	2	1.14	1-5	1-3
E5	98	2.18	2	1.15	1-5	1-3
E6-E9	99	2.42	2	1.27	1-6	1-3
O1-O5	48	3.17	3	0.93	1-6	3-4

Note. Scores: Novice = 1, One software program = 2; Several software program = 3, One program language + software = 4, Program languages + software = 5; Bill Gates hire = 6.

Table A-23
Descriptive Statistics on Self-Ratings of Computer Skill by Battalion Element

Battalion Element	Self-Ratings of Computer Skill					
	N	*M*	*Mdn*	*SD*	Range	Interquartile
Bn & Bde Staff	163	2.58	3	1.12	1-6	2-3
Field Artillery	55	2.40	3	1.15	1-6	1-3
Engineers	61	2.16	2	1.16	1-5	1-3
Medics	70	1.99	2	1.06	1-5	1-3
Infantry	337	1.96	1	1.14	1-6	1-3

Note. Scores: Novice = 1, One software program = 2; Several software program = 3, One program language + software = 4, Program languages + software = 5; Bill Gates hire = 6.

Table A-24
Descriptive Statistics on Icon Test Scores by Rank

Rank	18-Item Icon Test					
	N	*M*	*Mdn*	*Range*	*SD*	Interquartile Range
E1-E2	120	6.66	7	0-15	4.34	3-10
E3	106	6.05	6.5	0-15	4.21	3-10
E4	220	8.29	9	0-17	4.69	5-12
E5	98	9.36	9.75	0-17	4.12	7-12
E6-E9	99	10.97	12	0-18	4.28	8-14
O1-O5	48	13.14	13.5	7-17	2.22	11.5-15

Table A-25
Descriptive Statistics on Icon Test Scores by Battalion Element

Battalion Element	18-Item Icon Test					
	N	*M*	*Mdn*	*Range*	*SD*	Interquartile Range
Bn & Bde Staff	163	11.19	12	0-18	4.53	8.5-15
Field Artillery	55	9.04	9	0-15	4.09	6-12
Engineers	61	8.14	9	0-16	4.38	6-11
Medics	70	7.80	8	0-13.5	3.44	6-11
Infantry	342	7.41	8	0-17	4.70	4-11

Table A-26
Icon Difficulty

Easy Icons	% Correct	Icons of Intermediate Difficulty	% Correct	Difficult Icons	% Correct
Recycle	82%	Cut	74%	Paste	25%
		Print	73%	Fill	21%
		Spell check	73%	New file	15%
		Open file	69%	Group	10%
		Help	64%	Arrow	3%
		Zoom	55%		
		Save	50%		
		Close	50%		
		Cursor	45%		
		Copy	45%		
		Center	44%		
		Undo	37%		

Note. Easy Icons: 75% or more soldiers identified correctly. Intermediate difficulty icons: 26% to 74% of soldiers identified correctly. Difficult icons: 25% or fewer soldiers identified correctly.

Table A-27
Percentage of Soldiers Correctly Naming Each Icon by Rank

Rank	Icon Name						
	N	Spell Check	Cursor	Zoom	Open File	Save	Print
E1-E2	120	68%	43%	46%	62%	38%	62%
E3	106	54%	37%	51%	50%	27%	62%
E4	220	69%	43%	55%	66%	49%	73%
E5	98	79%	50%	61%	76%	56%	78%
E6-E9	99	88%	53%	60%	82%	62%	78%
O1-O5	48	96%	54%	71%	94%	94%	100%
		Cut	Copy	Paste	Undo	New File	Arrow
E1-E2	120	61%	38%	8%	15%	10%	0%
E3	106	60%	25%	6%	12%	4%	1%
E4	220	71%	44%	23%	37%	11%	1%
E5	98	86%	45%	21%	42%	19%	2%
E6-E9	99	89%	62%	51%	66%	23%	8%
O1-O5	48	98%	81%	69%	77%	48%	13%
		Recycle	Help	Center	Fill	Close	Group
E1-E2	120	77%	50%	27%	15%	36%	2%
E3	106	71%	51%	32%	10%	40%	1%
E4	220	83%	64%	42%	18%	55%	6%
E5	98	88%	70%	47%	19%	60%	9%
E6-E9	99	88%	78%	65%	33%	59%	27%
O1-O5	48	90%	94%	71%	48%	52%	31%

Table A-28
Percentage of Soldiers Correctly Naming Each Icon by Battalion Element

Battalion Element	*N*	Spell Check	Cursor	Zoom	Open File	Save	Print
		Icon Name					
Bn & Bde Staff	163	86%	47%	66%	79%	77%	82%
Field Artillery	55	71%	62%	72%	76%	52%	78%
Engineers	61	67%	54%	63%	71%	43%	66%
Medics	70	73%	43%	56%	70%	39%	80%
Infantry	342	67%	41%	56%	62%	43%	67%
		Cut	Copy	Paste	Undo	New File	Arrow
Bn & Bde Staff	163	87%	61%	53%	64%	41%	14%
Field Artillery	55	78%	53%	17%	29%	16%	0%
Engineers	61	75%	54%	0%	34%	13%	0%
Medics	70	82%	37%	0%	24%	12%	0%
Infantry	342	66%	36%	19%	28%	12%	0%
		Recycle	Help	Center	Fill	Close	Group
Bn & Bde Staff	163	89%	80%	66%	43%	56%	28%
Field Artillery	55	84%	80%	51%	15%	58%	0%
Engineers	61	80%	67%	32%	19%	60%	0%
Medics	70	87%	63%	37%	0%	57%	0%
Infantry	342	79%	54%	39%	17%	47%	0%

Table A-29
Percentage of Soldiers Using Computer Features as a Function of Computer Ownership

Own a Computer	Frequency of Use				
	Never	< Monthly	Monthly	Weekly	Daily
	Mouse				
Yes	1%	3%	2%	12%	83%
No	21%	23%	14%	23%	20%
	Icons				
Yes	3%	6%	5%	19%	67%
No	30%	24%	12%	21%	14%
	Menus				
Yes	4%	6%	5%	17%	69%
No	28%	26%	15%	17%	15%
	Internet				
Yes	3%	4%	4%	19%	71%
No	25%	23%	15%	22%	16%
	E-Mail				
Yes	4%	4%	3%	14%	74%
No	35%	20%	13%	18%	15%
	Games				
Yes	9%	16%	11%	29%	35%
No	29%	32%	14%	17%	8%
	Graphics				
Yes	10%	20%	15%	25%	30%
No	39%	33%	13%	8%	7%

Note. Within rounding error, rows sum to 100%. For all battalion elements combined, the *N* for computer ownership = 359. *N* for no ownership = 332.

Table A-30
Correlations Among Background Variables by Rank

Background Variable	Rank	Self-Rating	Own a Computer	Use a Computer	# Educational Settings
Use of Computer Features (Sum)	All	.51**	.65**	.66**	.10**
	E1-E2	.53**	.57**	.66**	.27**
	E3	.42**	.65**	.63**	.24*
	E4	.52**	.61**	.71**	.19**
	E5	.51**	.72**	.45**	.14
	E6-E9	.41**	.33**	.60**	.19
	O1-O5	.25	-.03	---	-.09
Self-Rating	All		.37**	.33**	.21**
	E1-E2		.34**	.45**	.36**
	E3		.28**	.27**	.28**
	E4		.40**	.34**	.26**
	E5		.38**	.19	.30**
	E6-E9		.09	.22*	.23*
	O1-O5		.04	---	.07
Own a Computer	All			.43**	-.05
	E1-E2			.34**	.20*
	E3			.31**	-.07
	E4			.45**	.11
	E5			.37**	.04
	E6-E9			.33**	.06
	O1-O5			---	.01
Use a Computer	All				.04
	E1-E2				.14
	E3				.06
	E4				.14*
	E5				-.02
	E6-E9				.17
	O1-O5				---

Note. Sample sizes for each correlation varied with the number of missing data points for each variable. For the total sample the $N = 691$; E1&E2 $N = 120$; E3 $N = 106$; E4 $N = 220$; E5 $N = 98$; E6-E9 $N = 99$; O1-O5 $N = 48$.

Correlations for using a computer for group O1-O5 could not be calculated because all used a computer.

*$p < .05$, **$p < .01$, ***$p < .001$, ****$p < .0001$

Table A-31
Correlations Among Background Variables by Battalion Element

Background Variable	Bn Element	Self-Rating	Own a Computer	Use a Computer	# Educational Settings
Use of Computer Features (Sum)	All	.51**	.65**	.66**	.10**
	Bn Staff	.47**	.45**	.48**	.19*
	Fld Arty	.44**	.68**	.79**	.10
	Eng	.51**	.75**	.67**	.05
	Medics	.56**	.49**	.51**	.12
	Infantry	.48**	.69**	.69**	.11*
Self-Rating	All		.37**	.33**	.21**
	Bn Staff		.30**	.28**	.22**
	Fld Arty		.48**	.33*	.10
	Eng		.30*	.22	.40**
	Medics		.34**	.31**	.35**
	Infantry		.35**	.34**	.21**
Own a Computer	All			.43**	-.05
	Bn Staff			.27**	-.01
	Fld Arty			.51**	-.13
	Eng			.50**	-.07
	Medics			.29*	-.21
	Infantry			.46**	.02
Use a Computer	All				.04
	Bn Staff				.04
	Fld Arty				.11
	Eng				-.18
	Medics				.13
	Infantry				.08

Note. Sample sizes for each correlation varied with the number of missing data points for each variable. For the total sample the $N = 691$; Bn & Bde Staff $N = 163$; Field Artillery $N = 55$; Eng $N = 61$; Medics $N = 70$; Infantry $N = 342$.
*$p < .05$, **$p < .01$, ***$p < .001$, ****$p < .0001$

Table A-32

Percentage of All Soldiers Indicating Experience With Computer Software Programs and Programming Languages, Displayed by Rank

	Percentage of Soldiers						
	E1-E2 (*n*=120)	E3 (*n*=106)	E4 (*n*=220)	E5 (*n*=98)	E6-E9 (*n*=99)	O1-O5 (*n*=48)	All Groups (*n*=691)
Software Programs							
Office Type	6%	5%	11%	16%	29%	40%	15%
Word Processing	12%	10%	17%	20%	19%	44%	18%
Spreadsheets	8%	5%	14%	17%	20%	40%	15%
Graphics	6%	5%	11%	17%	17%	54%	14%
Operating Systems	20%	16%	12%	11%	15%	21%	15%
Other Software	3%	2%	9%	14%	17%	33%	10%
Programming Languages	3%	1%	11%	9%	12%	31%	9%

Table A-33

Percentage of All Soldiers Indicating Experience With Computer Software Programs and Programming Languages, Displayed by Battalion Element

	Percentage of Soldiers					
	Bn & Bde Staff (*n* = 163)	Field Artillery (*n* = 55)	Engineers (*n* = 61)	Medics (*n* = 70)	Infantry (*n* = 342)	All Elements (*n* = 691)
Software Programs						
Office Type	23%	18%	26%	13%	8%	15%
Word Processing	33%	18%	18%	20%	10%	18%
Spreadsheets	29%	20%	13%	17%	6%	15%
Graphics	28%	15%	21%	10%	6%	14%
Operating Systems	15%	27%	25%	7%	13%	15%
Other Software	18%	11%	20%	3%	6%	10%
Programming Languages	14%	22%	8%	4%	6%	9%

Note. Not all the soldiers who indicated they were skilled with software packages answered this question. A soldier was counted only once if he indicated skill with more than one software program within a specific category, e.g., knew both Word and Word Perfect word processing programs, or knew several programming languages, Basic, C++ and Pascal. Excluded from these tallies were generic responses such as "spreadsheets," "word processing," and "all graphics" programs. To be included in the count, a specific software program had to be listed by the soldier.

Table A-34

Percentage of All Soldiers Indicating Experience With Specific Software Programs and Languages, Displayed by Battalion Element

	Percentage of Soldiers					
	Bn & Bde Staff (n = 163)	Field Artillery (n = 55)	Engineers (n = 61)	Medics (n = 70)	Infantry (n = 342)	All Elements (n = 691)
Office Type						
Microsoft Office	8%	4%	7%	3%	2%	4%
Microsoft Works	0%	2%	2%	1%	1%	1%
Lotus Smart Suite	1%	1%	1%	0%	0%	0%
Other	1%	0%	1%	0%	0%	0%
Word Processing						
Microsoft Word	8%	4%	4%	4%	2%	4%
Word Perfect	1%	2%	1%	1%	1%	1%
Other	0%	1%	0%	0%	0%	0%
Spreadsheets						
Microsoft Excel	7%	5%	3%	4%	1%	3%
Other	1%	1%	0%	1%	0%	0%
Graphics						
Power Point	6%	1%	2%	2%	1%	2%
Adobe	1%	0%	1%	0%	0%	0%
Corel Draw	1%	1%	0%	0%	0%	0%
Other	1%	2%	2%	1%	1%	1%
Operating Systems						
Windows	4%	6%	6%	2%	3%	4%
DOS	1%	2%	0%	0%	0%	1%
Other OS	0%	0%	0%	0%	0%	0%
Other Software						
Form Flow	2%	1%	2%	0%	0%	1%
Calendar	1%	1%	1%	0%	0%	0%
Financial	1%	0%	1%	0%	0%	0%
Internet/E-mail	1%	1%	2%	0%	1%	1%
Other	3%	1%	1%	0%	1%	1%
Programming Languages						
BASIC	1%	1%	1%	1%	0%	1%
C++	1%	1%	0%	0%	0%	0%
HTML	1%	0%	0%	0%	0%	0%
Other	1%	1%	1%	0%	0%	1%

Note. Not all the soldiers who indicated skill with software packages answered this question. Each citation of a specific software package or programming language was tallied in computing the percentages. If a soldier cited Power Point and Adobe, each was tallied.

Table A-35

Percentage of Non-novice Soldiers Indicating Experience With Computer Software Programs, Displayed by Battalion Element

	Percentage of Soldiers					
	Bn &Bde Staff	Field Artillery	Engineer	Medics	Infantry	All Elements
# Non-novice Soldiers	124 of 163	39 of 55	35 of 61	37 of 70	165 of 337	400 of 686
Response Rate by Non novices	77% (95/124)	72% (28/39)	77% (27/35)	62% (23/37)	52% (86/165)	65% (259/400)
% Non-novice Soldiers Listing Programs – by Software Category						
Office Type	40% (38/95)	36% (10/28)	52% (14/27)	39% (9/23)	31% (27/86)	38% (98/259)
Word Processing	56% (53/95)	36% (10/28)	41% (11/27)	61% (14/23)	40% (34/86)	47% (122/259)
Spreadsheets	50% (47/95)	39% (11/28)	30% (8/27)	52% (12/23)	24% (21/86)	38% (99/259)
Graphics	48% (46/95)	29% (8/28)	48% (13/27)	30% (7/23)	26% (22/86)	37% (96/259)
Operating Systems	25% (24/95)	54% (15/28)	48% (13/27)	22% (5/23)	48% (41/86)	38% (98/259)
Other Software	31% (29/95)	21% (6/28)	37% (10/27)	9% (2/23)	26% (22/86)	27% (69/259)

Note. A soldier was counted only once if he indicated skill with more than one software program within a specific category, e.g., knew both Word and Word Perfect word processing programs. To be included in the count, a specific software program, by name, had to be listed by the soldier. Soldiers who indicated novice computer skill but answered the software question were eliminated from this analysis ($n = 10$).

Table A-36

Percentage of Non-novice Soldiers Listing Specific Software Programs, Displayed by Software Category and by Battalion Element

	Percentage of Soldiers					
	Bn & Bde Staff (*n* = 95)	Field Artillery (*n* = 28)	Engineers (*n* = 27)	Medics (*n* = 23)	Infantry (*n* = 86)	All Elements (*n* = 259)
Office Type						
Microsoft Office	100% (38/38)	60% (6/10)	86% (12/14)	78% (7/9)	85% (23/27)	88% (86/98)
Microsoft Works	5% (2/38)	30% (3/10)	14% (2/14)	22% (2/9)	22% (6/27)	15% (15/98)
Lotus Smart Suite	11% (4/38)	10% (1/10)	7% (1/14)	0% (0/9)	11% (3/27)	9% (9/98)
Other	8% (3/38)	0% (0/10)	7% (1/14)	0% (0/9)	7% (2/27)	6% (6/98)
Word Processing						
Microsoft Word	93% (49/53)	80% (8/10)	82% (9/11)	86% (12/14)	79% (27/34)	86% (105/122)
Word Perfect	11% (6/53)	40% (4/10)	18% (2/11)	14% (2/14)	29% (10/34)	20% (24/122)
Other	2% (1/53)	30% (3/10)	0% (0/11)	0% (0/14)	0% (0/34)	3% (4/122)
Spreadsheets						
Microsoft Excel	96% (45/47)	100% (11/11)	100% (8/8)	92% (11/12)	85% (17/21)	94% (92/99)
Other	6% (3/47)	9% (1/11)	0% (0/8)	17% (2/12)	14% (3/21)	9% (9/99)
Graphics						
Power Point	83% (38/46)	38% (3/8)	39% (5/13)	86% (6/7)	64% (14/22)	69% (66/96)
Adobe	7% (3/46)	0% (0/8)	23% (3/13)	0% (0/7)	14% (3/22)	9% (9/96)
Corel Draw	7% (3/46)	13% (1/8)	0% (0/13)	14% (1/7)	5% (1/22)	6% (6/96)
Other	17% (8/46)	50% (4/8)	39% (5/13)	29% (2/7)	41% (9/22)	29% (28/96)
Operating Systems						
Windows	96% (23/24)	87% (13/15)	100% (13/13)	100% (5/5)	98% (40/41)	96% (94/98)
DOS	21% (5/24)	33% (5/15)	0% (0/13)	20% (1/5)	15% (6/41)	17% (17/98)
Other Software						
Form Flow	41%	50%	30%	50%	23%	35%

	(12/29)	(3/6)	(3/10)	(1/2)	(5/22)	(24/69)
Calendar	10% (3/29)	17% (1/6)	20% (2/10)	50% (1/2)	5% (1/22)	12% (8/69)
Financial	10% (3/29)	0% (0/6)	30% (3/10)	0% (0/2)	18% (4/22)	14% (10/69)
Internet/E-mail	28% (8/29)	33% (2/6)	40% (4/10)	0% (0/2)	45% (10/22)	35% (24/69)
Other	66% (19/29)	17% (1/6)	30% (3/10)	0% (0/2)	41% (9/22)	46% (32/69)

Note. Not all the soldiers who indicated skill with software packages answered this question. Each citation of a specific software package was tallied in computing the percentages. If a soldier cited Power Point and Adobe, each was tallied.

Table A-37

Percentage of Non-novice Soldiers Listing Programming Languages, Displayed by Battalion Element

Response Rates	**Percentage of Soldiers**					
	Bn &Bde Staff	Field Artillery	Engineer	Medics	Infantry	All Elements
All Soldiers	14% (23/163)	22% (12/55)	8% (5/61)	4% (3/70)	6% (20/342)	9% (63/691)
Non-novices	19% (23/124)	31% (12/39)	14% (5/35)	8% (3/37)	12% (20/165)	16% (63/400)
Breakdown for Non-novices						
Soldiers With No Programming Experience	7% (7/97)	21% (7/33)	0% (0/29)	3% (1/33)	2% (3/126)	6% (18/318)
Soldiers With Programming Experience [a]	59% (16/27)	83% (5/6)	83% (5/6)	50% (2/4)	44% (17/39)	55% (45/82)

Note. A soldier was counted only once if he indicated skill with more than one programming language, e.g., knew Basic, C++ and Pascal. Excluded from these tallies were generic responses. To be included in the count, a specific programming language had to be listed by the soldier.

[a] This is the only group of soldiers who should have answered the programming language question. However, there were 18 of the 318 (see previous row) who said they had no programming experience and listed a programming language. No soldier who indicated novice computer skill answered the programming question.

Table A-38

Percentage of Soldiers With Programming Experience Listing Specific Programming Languages

Programming Languages	Bn/Bde Staff (n = 16)	Field Artillery (n = 5)	Engineer (n = 5)	Medics (n = 2)	Infantry (n = 17)	All Elements (n = 45)
BASIC	38%	40%	60%	100%	53%	49%
C++	56%	60%	40%	50%	41%	49%
HTML	38%	40%	40%	0%	18%	29%
Pascal	19%	20%	40%	50%	18%	22%
Other	19%	60%	40%	0%	35%	31%

Note. Overall response rate to this question was 55% (see Table A-37). Each citation of a specific programming language was tallied in computing the percentages. If a soldier cited BASIC and C++, each was tallied. Consequently, column sums for soldiers within a specific battalion element can be greater than 100%.

Appendix B

Data Tables for Specialists

Table B-1
Descriptive Statistics on Age for Specialists

Battalion Element	***N***	***M***	***Mdn***	***SD***	**Min & Max Values**	**Lower & Upper Quartiles (25^{th}-75^{th})**
Bn & Bde Staff	49	24.08	23	3.19	20-36	21.5-26
Field Artillery	13	23.08	22	4.23	20-36	20.5-24
Engineers	23	24.26	23	3.82	19-32	21-27
Medics	32	23.94	23	3.70	20-37	21-26
Infantry	102	23.17	22	2.92	20-33	21-25

Table B-2
Number of Educational Settings Where Specialists Used a Computer

Battalion Element	**# Educational Settings Used a Computer (% Specialists)**					
	0	1	2	3	4-5	*M* Settings
Bn & Bde Staff	12%	44%	22%	16%	6%	1.60
Field Artillery	8%	39%	39%	8%	8%	1.69
Engineers	9%	39%	30%	17%	4%	1.69
Medics	9%	34%	22%	16%	19%	2.00
Infantry	6%	47%	21%	17%	10%	1.77

Table B-3
Percentage of Specialists Indicating Computer Ownership and Current Use of a Computer

Battalion Element	**% Own a Computer**	**% Use Computer Now**	**Where Currently Use Computer**		
			Home	Work/ Unit	Trng Facility
Bn & Bde Staff	52%	98%	62%	84%	20%
Field Artillery	62%	77%	69%	39%	23%
Engineers	65%	87%	78%	22%	22%
Medics	41%	94%	72%	69%	38%
Infantry	45%	72%	59%	16%	17%

Table B-4
Percentage of Specialists Indicating Different Levels of Typing Skill

Battalion Element	Self Ratings of Typing Skill			
	Hunt & Peck Slowly	Hunt & Peck Quickly	Type Slowly	Type Quickly
Bn & Bde Staff	6%	40%	22%	32%
Field Artillery	0%	46%	23%	31%
Engineers	26%	48%	13%	13%
Medics	16%	38%	34%	13%
Infantry	20%	39%	28%	13%

Table B-5
Descriptive Statistics on the Sum of Feature Use Ratings for Specialists

Battalion Element	Sum of Feature Use Ratings					
	N	*M*	*Mdn*	*SD*	Min & Max Values	Lower & Upper Quartiles (25^{th}-75^{th})
Bn & Bde Staff	50	21.14	22.5	6.18	0-28	18-26
Field Artillery	13	20.23	23	8.48	4-28	14-28
Engineers	23	17.87	22	9.47	0-28	12-25
Medics	32	17.97	19	6.27	7-28	13-22
Infantry	102	14.31	15	9.53	0-28	7-24

Note. The 7 features were rated on a 0 to 4-point scale, ranging from "never" used to "daily" use. Maximum score was 28 representing daily use of all 7 features; minimum score was 0 indicating a soldier never used any of the 7 features.

Table B-6

Frequency With Which Computer Features are Used: Percentage of Specialists by Battalion Element

Group	Frequency (% Specialists)				
	Daily	Weekly	Monthly	< Monthly	Never
	Mouse				
Bn & Bde Staff	76%	14%	0%	8%	2%
Field Artillery	62%	23%	8%	8%	0%
Engineers	48%	26%	9%	4%	13%
Medics	41%	47%	3%	9%	0%
Infantry	37%	19%	8%	16%	21%
	Games				
Bn & Bde Staff	26%	28%	10%	18%	18%
Field Artillery	46%	23%	8%	15%	8%
Engineers	48%	30%	4%	4%	13%
Medics	13%	31%	13%	31%	13%
Infantry	19%	24%	12%	20%	27%
	Icons				
Bn & Bde Staff	60%	24%	2%	10%	4%
Field Artillery	39%	46%	0%	8%	8%
Engineers	44%	22%	4%	13%	17%
Medics	31%	41%	3%	19%	6%
Infantry	25%	21%	14%	17%	25%
	Menus				
Bn & Bde Staff	66%	14%	6%	12%	2%
Field Artillery	54%	23%	0%	15%	8%
Engineers	48%	13%	9%	9%	22%
Medics	31%	38%	3%	19%	9%
Infantry	28%	18%	13%	18%	24%

Table B-6 (cont.)
Frequency With Which Computer Features are Used: Percentage of Specialists by Battalion Element

Group	Frequency (% Specialists)				
	Daily	**Weekly**	**Monthly**	**< Monthly**	**Never**
	Graphics				
Bn & Bde Staff	30%	18%	20%	22%	10%
Field Artillery	31%	15%	0%	15%	39%
Engineers	17%	4%	22%	17%	39%
Medics	13%	22%	16%	31%	19%
Infantry	12%	15%	10%	30%	33%
	E-Mail				
Bn & Bde Staff	60%	14%	8%	14%	4%
Field Artillery	62%	8%	15%	8%	8%
Engineers	48%	13%	13%	13%	13%
Medics	44%	22%	13%	9%	13%
Infantry	36%	15%	9%	14%	27%
	Internet				
Bn & Bde Staff	66%	14%	8%	8%	4%
Field Artillery	54%	23%	8%	8%	8%
Engineers	44%	22%	9%	13%	13%
Medics	41%	31%	6%	22%	0%
Infantry	36%	19%	8%	15%	23%

Table B-7
Percentage of Specialists Indicating Different Levels of Computer Skill

Battalion Element	Self-Ratings of Computer Skill						
	N	Novice	Good w 1 softw program	Good w several Soft Progr	1 Progm Lang + Software	Several Progm Lang+Soft	Bill Gates hire me
Bn & Bde Staff	50	26%	16%	44%	14%	0%	0%
Field Artillery	13	23%	23%	23%	23%	8%	0%
Engineers	23	52%	9%	35%	4%	0%	0%
Medics	32	50%	13%	31%	6%	0%	0%
Infantry	101	58%	13%	16%	11%	2%	0%

Table B-8

Descriptive Statistics on Self-Ratings of Computer Skill for Specialists

Battalion Element	**Self-Ratings of Computer Skill**					
	N	*M*	*Mdn*	*SD*	Range	Interquartile
Bn & Bde Staff	50	2.46	3	1.03	1-4	1-3
Field Artillery	13	2.69	3	1.32	1-5	2-4
Engineers	23	1.91	1	1.04	1-4	1-3
Medics	32	1.94	1.5	1.05	1-4	1-3
Infantry	101	1.85	1	1.16	1-5	1-3

Note. Scores: Novice = 1, One software program = 2; Several software program = 3, One program language + software = 4, Program languages + software = 5; Bill Gates hire = 6.

Table B-9

Descriptive Statistics on Icon Test Scores for Specialists

	18-Icon Test				
Battalion Element	*M*	*Mdn*	*Range*	*SD*	Interquartile Range
Bn & Bde Staff	10.72	11.5	0-17	4.66	7-15
Field Artillery	9.08	9	0-15	3.92	7-11
Engineers	7.61	9	0-14	4.03	6-9.5
Medics	8.14	9.25	0-13.5	3.76	5-11
Infantry	7.19	7	0-15	4.82	3-11

Table B-10

Percentage of All Specialists Indicating Experience With Computer Software Programs and Programming Languages

	Percentage of Specialists					
	Bn & Bde Staff (n = 50)	Field Artillery (n = 13)	Engineers (n = 23)	Medics (n = 32)	Infantry (n = 102)	All Elements (n = 691)
Software Programs						
Office Type	18%	8%	17%	13%	7%	15%
Word Processing	32%	8%	22%	25%	8%	18%
Spreadsheets	32%	15%	17%	16%	3%	15%
Graphics	22%	23%	17%	16%	1%	14%
Operating Systems	14%	15%	17%	6%	12%	15%
Other Software	14%	8%	22%	0%	6%	10%
Programming Languages	16%	31%	4%	6%	8%	9%

Note. Not all the specialists who indicated they were skilled with software packages answered these questions. A soldier was counted only once if he indicated skill with more than one software program within a specific category, e.g., knew both Word and Word Perfect word processing programs, or knew several programming languages, Basic, C++ and Pascal. Excluded from these tallies were generic responses such as "spreadsheets," "word processing," and "all graphics" programs. To be counted, a specific software program had to be listed.

Table B-11
Percentage of Non-novice Specialists Listing Software Programs

	Percentage of Specialists					
	Bn &Bde Staff	Field Artillery	Engineer	Medics	Infantry	All Elements
# Non-novice Specialists	37 of 50	10 of 13	11 of 23	16 of 32	42 of 101	116 of 219
Response Rate by Non novices	68% (25/37)	60% (6/10)	82% (9/11)	63% (10/16)	52% (22/42)	62% (72/116)
% Non-novice Specialists Listing Software Programs - by Software Category						
Office Type	36% (9/25)	17% (1/6)	44% (4/9)	40% (4/10)	32% (7/22)	35% (25/72)
Word Processing	60% (15/25)	17% (1/6)	56% (5/9)	80% (8/10)	36% (8/22)	51% (37/72)
Spreadsheets	60% (15/25)	33% (2/6)	44% (4/9)	50% (5/10)	14% (3/22)	40% (29/72)
Graphics	44% (11/25)	50% (3/6)	44% (4/9)	50% (5/10)	5% (1/22)	33% (24/72)
Operating Systems	28% (7/25)	33% (2/6)	33% (3/9)	20% (2/10)	50% (11/22)	35% (25/72)
Other Software	28% (7/25)	17% (1/6)	56% (5/9)	0% (0/10)	27% (6/22)	26% (19/72)

Note. A soldier was counted only once if he indicated skill with more than one software program within a specific category, e.g., knew both Word and Word Perfect word processing programs. To be included in the count, a specific software program had to be listed by the soldier. Soldiers who indicated novice computer skill but answered the software question were eliminated from this analysis ($n = 3$).

Table B-12
Percentage of Specialists Listing Programming Languages

Response Rates	Percentage of Specialists					
	Bn &Bde Staff	Field Artillery	Engineer	Medics	Infantry	All Elements
All Skill Levels	16% (8/50)	31% (4/13)	4% (1/23)	6% (2/32)	8% (8/102)	11% (23/220)
Non Novices	22% (8/37)	40% (4/10)	9% (1/11)	13% (2/16)	19% (8/42)	20% (23/116)
Breakdown for Non-novices						
Specialists With no Programming Experience	10% (3/30)	0% (0/6)	0% (0/10)	7% (1/14)	0% (0/29)	5% (4/89)
Specialists With Programming Experience [a]	71% (5/7)	100% (4/4)	100% (1/1)	50% (1/2)	62% (8/13)	70% (19/27)

Note. A soldier was counted only once if he indicated skill with more than one programming language, e.g., knew Basic, C++ and Pascal. Excluded from these tallies were generic responses. To be counted, a specific programming language had to be listed by the soldier.
[a] This is the only group of soldiers who should have answered the question. However, there were 4 of the 89 specialists (see prior row in table) who said they had no programming experience, yet listed a programming language. No soldiers who indicated novice computer skill answered the programming question.

Appendix C

Survey Forms

US ARMY RESEARCH INSTITUTE, FT. BENNING, G/

COMPUTER SURVEY

The U.S. Army Research Institute (ARI) Field Unit at Fort Benning, Georgia is conducting research to determine the computer use and skills of Army personnel. The long-range goal is to determine possible training needs as requirements for computer use increase for all duty positions.

The attached questionnaire contains items designed to determine how much and at what level of expertise you use computers. Also, there is a test of your ability to identify the functions of various icons.

Please respond to all items in the spaces provided. For statistical purposes, we ask that you provide your name and other background information.

We appreciate your cooperation and your time. Your responses will remain anonymous in the processing of all data.

Name:_____

Age: _____

Rank/Grade (*Circle one*).

E1 E2 E3 E4 E5 E6 E7 E8 E9

O1 O2 O3 O4 O5 O6

WO1 CW2 CW3 CW4 CW5

Years and months active duty in Army: _____years _____months

What is your current duty position? _____

What is your unit? _____

What is your Branch? (*Circle one*):

Infantry Armor Field Artillery Combat Engineer Medical Service Other _____

If officer, what is your source of commission? (*Circle one*): West Point ROTC OCS

If enlisted, what is your MOS? _____

1. When did you use computers in your education? *(Circle all that apply)*
   Grade School Jr High High School Technical School College Did Not Use

2. Where do you currently use a computer? *(Circle all that apply)*

   Home/barracks/BOQ Unit/Work Site Library/Learning Ctr/Training Facility Do Not Use

3. For *each* of the following questions, *circle the response* that best describes you.

   a. Do you own a personal computer? Yes No

   b. How often do you: (circle how frequently you use each)
   - Use a mouse? Daily, Weekly, Monthly, Less Often, Never
   - Play computer games? Daily, Weekly, Monthly, Less Often, Never
   - Use icon-based programs/software? Daily, Weekly, Monthly, Less Often, Never
   - Use programs/software with pull-down menus? Daily, Weekly, Monthly, Less Often, Never
   - Use graphics/drawing features in software packages? Daily, Weekly, Monthly, Less Often, Never
   - Use E-mail (at home or at work)? Daily, Weekly, Monthly, Less Often, Never
   - Use the Internet? Daily, Weekly, Monthly, Less Often, Never

4. Which of the following best describes your typing ability? (*check √ one*)
   ____ Hunt and peck slowly
   ____ Hunt and peck quickly
   ____ Type slowly while not looking at the keyboard
   ____ Type quickly while not looking at the keyboard

5. Which of the following best describes your expertise with computers? (*check √ one*)
   ____ Novice
   ____ Good with one type of software package (such as word processing or work calendars or slides)
   ____ Good with several software packages
   ____ Can program in one language and use several software packages
   ____ Can program in several languages and use several software packages
   ____ Expert – Bill Gates would hire me

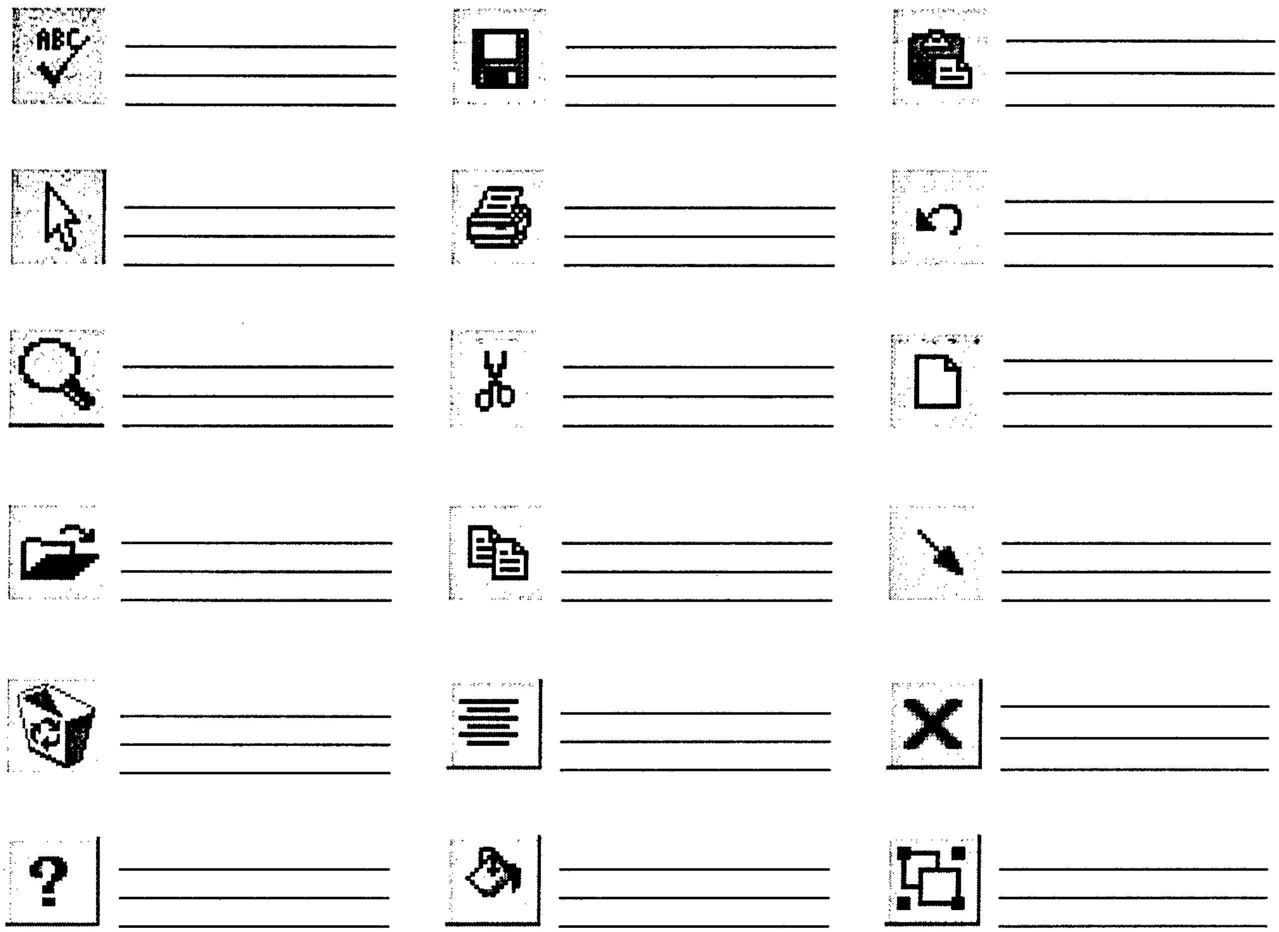
   If you are good with one or more software packages, please list them.

   _____

   If you can program in one or more languages, please name these languages.

   _____

6. What is the function of the following icons?



Appendix D

Scoring of Computer Icons

Spellcheck
Spelling
Spelling & Grammar

Save to disk
Save
Save to hard drive
To save information

½: Save disk—backup
½: Disk floppy (save)
½: Insert Disk or Save
½: 3.5 floppy save

½: Store
½: Disk save
½: Save as

0: Hard drive
0: Normally A Drive
0: Floppy disk to excess
0: Open disk

0: Disk
0: Insert disk
0: Removable disk

Mouse/Point **Pointer**
Point/Select **Cursor**
Mouse Arrow or Pointer **Pointer Arrow**
Points to desired function
Return to point/click icon or cursor itself
Large Mouse Pointer
To choose options on screen
Use of mouse (select)

0: Click on item/Point 0: Mouse icon
0: Indicator 0: Locator
0: Manipulate shape 0: Mouse
0: Pick object or picture 0: Points to Icons
0: To click on different icons 0: Clicker
0: Switch to cursor or to arrow 0: Arrow
0: Select object 0: Return to arrow
0: To activate icons or put down menus 0: Point

Print
Printing
Print Function

½: Print/Fax

0: Fax
0: Faxing
0: Printer
0: Printer page
0: Printer select
0: Printer (activate)
0: Copy

Zoom **Magnify**
Increase image **Amplify**
Zoom in or out **Enlarge**
Magnify selected section on paper or picture

½: To search for something ½: Magnifies
½: Pointer magnifier ½: Search
½: Search/Zoom ½: Find
½: Make item larger

0: Print Preview
0: Enhance 0: Next page
0: Print preview 0: Preview
0: Bigger 0: Closer look
0: Scan 0: Look
0: View 0: View Document
0:Search files

Cut
Edit (cut out)
Cut/Copy

0: Cut pages 0: Clip
0: Edit a document 0: Cut sentences
0: Cut and paste 0: Cut/Paste

Open file/Document **Open folder** **To Open Files** 0: Open Cycle 0: File Download 0: File 0: Folder 0: Computer Folder	**Open** **File Open**	**Copy** **Duplicate** ½: Paste or copy 0: Copied file 0: Print front and back 0: Page layout—All 0: Create Document 0: Show both pages 0: Copy to another paper	½: Page 2 or copy 0: 2 sided 0: Paste copy 0: Pages 0: File 0: Copy/Paste 0: Double copy
Recycle Bin **Trash Bin** **Empty Trash** ½: Delete 0: Waste Basket 0: Garbage	**Recycle** **Trash** **Trash Can** ½: Discard	**Center Paragraph** **Align Text Center** **Center Align** ½: Justify Center 0: Center page 0: Change Paragraph 0: Arrange Sentences 0: Letter Form 0: Align margins in middle	**Center Text** **Center** ½: Middle Align 0: Format 0: Margin 0: Text 0: Align 0: Center document
Question/Help **What is this** **Office Assistant** 0: Question	**Help** **Information**	**Fill with Color** **Shading** **Fill Color** ½: Paint/Fill Color ½: Coloring ½: Paint Fill ½: Paste color 0: Paint 0: Color 0: Color/Paint 0: Paint background	**Fill** **Fill White** ½: Change Color ½: Fill/Unfill ½: Add Color 0: Paintbrush 0: Font Color 0: Shade

Paste
Paste from clipboard

½: Clipboard for copy/paste

0: Proofread
0: Paste to clipboard
0: Attached file
0: Put certain data on clipboard
0: Detach from clipboard or clipboard only

0: Clipboard
0: Notepad
0: Chart

Undo
Go back or undo
Undo/Redo

0: Backup one
0: Redo
0: Flip page
0: Back
0: Rotate
0: Last
0: Undelete

0: Back step
0: Make subtitle
0: Flip over
0: Go back
0: Rotate text
0: Move to
0: Restore

New file
New document [*Word*]
New slide [*PowerPoint*]
New workbook [*Excel*]

½: New
½: File

½: New Form
½: New page or File

0: 1 sided
0: Paste
0: Page
0: Document
0: New page

0: New project
0: Page layout(s)
0: Turn page
0: New sheet
0: Next page

Draw arrow

½: Drawer
½: Draw a line/Draw line
½: Arrow Tool
½: Draw line with arrows

½: Draw
½: Draw tool
½: Line
½: Makes an arrow

0: Drag
0: Pointer
0: Special function
0: Small mouse pointer
0: Line with arrows 0:

0: Locator
0: Angle text
0: Cursor
0: Arrow

Close Application
Close Program
Close Window

Exit
Close
Close Screen

½: Close page
½: Delete/Close File
½: Quit Program

½: Close Out
½: End Program
½: Out-Close

0: Max/Close
0: Delete/Remove
0: Cancel or leave page
0: Open/Close

0: Go Back Close
0: Cancel Screen
0: Delete
0: Stop/End

Group

½: Group or ungroup

0: Graphics alignment
0: Resize
0: Move Windows

Grouping

½: Combine

0: Graphic
0: Minimize
0: Size Objects